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Editorial Comments

The I.C.H.C.A. Conference in Naples.

A number of the papers read at the general technical conference organised by the International Cargo Handling Co-ordination Association, and held in Naples recently, are featured in this issue. They can be conveniently divided into three sections, viz.: Port Construction and Administration; Port Operating Methods; and Port Equipment.

Port Construction and Administration.

The paper dealing with the problems confronting Civil Engineers covered a wide field and, of necessity, could only refer to them in general terms. Very rarely does the engineer, called upon to construct a new port, find himself entirely unfettered by restrictions arising from such matters as site conditions, expediency and the need for economy. This applies equally, of course, to the improvement or enlargement of existing ports. Indeed, many docks today owe the complexity and apparent eccentricities of their outlines and internal arrangements to such conditions of evolution. The ideal port is therefore, to all intents and purposes, unattainable.

The authors in their paper enumerated the requirements to be fulfilled as far as possible in a port and dealt with its initial planning, its quay layout and its transit sheds and warehouses—necessarily very broadly owing to the magnitude of the subject.

Referring to the question of protection of ports from waves and the weather, the authors referred to the investigation and experiment that had been done and was being done on the mechanics of waves and wave action. It could now be said that breakwaters could be designed with the knowledge that the causes of damage which had occurred in the past could now be foreseen and the probability of their recurrence minimised.

Regarding pneumatic breakwaters—a subject which has been referred to in past issues of this Journal—the authors mentioned the successful experiments that had been carried out at Madras with compressed air. This method of reducing wave action is perhaps not so uneconomic as is generally supposed; recent advances in technique point to a power consumption of between ½ H.P. and 1 H.P. per yard run for effective results.

The layout of modern deepwater quays for the handling of general cargo is a matter that has attracted a good deal of attention in recent years, and it has been suggested that attempts should be made by Port Authorities to arrive at a form of cargo handling procedure which might encourage rationalisation in dock operation and quay layout. It is clear, however, that local conditions and methods of port working differ widely throughout the world, so that only the broadest principles can be applied universally to the layout of docks and quays.

The form of accommodation—marginal quays, jetties or embayments in both tidal and impounded docks—will to a great extent affect the general layout, and their adoption will be governed almost entirely by the prevailing physical conditions. Other considerations which influence the facilities to be provided are the preponderating types of cargo which will have to be dealt with, and the means of transport—road, rail or inland waterways—which is available.

Another matter which directly influences transportation costs is the use of adequate cargo handling facilities. The selection of the best layout for quays, sheds and warehouses depends largely therefore upon the mechanical appliances and methods adopted for working the particular types of cargo.

Efficient quays and sheds are useless, however, unless there is a free flow of goods into and out of the ship, and to the various means of inland transport. In order to be properly effective, therefore, a quay and its ancillaries must be designed as part of the dock transportation system as a whole.

In the paper and the discussion which followed, there were some interesting views put forward on transit shed design which, if modern mechanical appliances are to be employed, is one of today's important matters. The tendency is to increase the width and height of the modern transit shed, for it is generally recognised that the greater use of mechanised equipment and the virtual disappearance of the hand truck make the additional cost of transporting cargo over a wider floor area a very minor item.

It follows therefore that, in the interests of free truck or crane movement, large spans completely free of obstruction are desirable. This at once leads up to the possibility of employing the corrugated concrete Ctesiphon arch as a simple and economical form of construction. For this system—described in a recent issue of this Journal—an interesting characteristic is claimed in that the thickness of the shell and the materials required per unit area of floor covered, remain virtually constant for spans ranging from 50-ft. to 300-ft. or even more, while the rise/span ratio may be varied at will. In the case where travelling cranes are required, no difficulties arise in strengthening the shells so that the runways can be carried directly by the arch.

A further paper in this section on "Port Administration" was much to the point on the question of the basic principles upon which efficient modern port administration should be built. It favoured concentrating effective control in the hands of one body; "a port must be managed as a unit."

Port Operating Methods.

This section was mainly concerned with organisation and port facilities.

Quay installations were often referred to and certain controversial matters were examined. There were advocates of full-portal cranes and those of semi-portal; the European system of "marginal" wharves with shore cranes was compared with that of the United States, where the majority of ports have finger piers equipped with housefalls.

Three interesting papers were respectively upon, firstly, the stevedores' point of view, in which the importance to the operating work of (a) the human element, (b) the technical element and (c) the cargo element, were stressed; and secondly, the responsibility for organisation in United States ports. In the latter paper, the author stated that the organisation which "has developed in what can best be described as an ad hoc manner, serves the need of shipping as adequately as the ports having the centralised form of organisation," and he pointed out that this can be extremely successful,

Editorial Comments—*continued*

even when applied to such a great port as New York. On the other hand, the same lecturer said that "the growing tendency in the United States to form local port authorities is an attempt to bring some plan and cohesion into the development of our ports." The third paper, on the loading and discharging of goods in regard to regular shipping lines, stressed that the prevention of many delays rests upon securing the maximum co-operation from railway authorities, customs authorities and exporters.

Some of the views expressed in a paper dealing with the training of ships' officers in cargo-handling may be acceptable to conditions applying in the United States, but they are unlikely to find wholehearted support in the merchantile marine of other countries.

Port Equipment.

A variety of subjects was dealt with in this section. An informative account was given of the discharge of Jamaica bananas in the Port of London, and another factual rather than controversial paper dealt with maritime transport by containers. It included an account of developments to date and also of the difficulties as well as the advantages of extending this type of transport. It rightly maintained that progress in this sphere should be judged by the effect of developments upon the quick turn-round of ships.

Some lecturers concentrated on the need to adapt ships, with the particular object in view of reducing cargo-handling delays. One paper advocated the use of the "wing loader," an ingenious device to move cargo away from the square of the hatch (or to it, in the discharging operation) by mechanical means, power being supplied by ships' winches. Another dealt with improvements which could result from equipping ships with bipod masts (needing no stays), special hatch covers on the weather deck and flush-type hatch covers on the main deck under shelter deck (to eliminate hatch coamings).

General Comment.

Although a continuous exchange of ideas is essential to progress in the port industry, and although there must also be cargo-handling co-ordination and standardisation at international level, types of administration as well as methods of goods handling will always vary because so much in port work depends upon, or evolves from factors inherent in local conditions. A study of the papers already mentioned emphasises this fact.

The conference at Naples seems to have been very successful, but in our view, the standard of the papers presented varied considerably. The difficulties confronting I.C.H.C.A. in organising international meetings of this nature—the differences in language and in the varying points of view of delegates from many nations—are appreciated; nevertheless the Executive would be well advised to be more selective in their choice of speakers. They should also consider whether it is advisable to hold so many conferences at such frequent intervals, as their members cannot afford the time to attend all the meetings; also, in view of the limited range of subjects to be discussed, there is a danger of too much repetition.

Investment Allowance for Drydock Excavation Costs.

In view of the number of drydocks which have been, and are being constructed in the United Kingdom, it is interesting to note that an amendment to the Finance Bill at present before the House of Commons has been approved. This proposed alteration in the taxation allowance is of particular interest to the ship-building and ship repairing industry as its purpose is to make some extension to the present investment allowance, by bringing within its scope the expenditure incurred in cutting, tunnelling and the general preparation of land for industrial structures. The amendment would therefore cover excavation costs of new drydocks, water works, railway tunnels and so forth. The Government concession can be described as timely, when two projects for the construction of large drydocks on the North East coast are still in their early stages.

The amount of expenditure affected by the amendment is considerable. Up to 15 per cent. of the cost of building a graving dock may be accounted for by the work of excavation, according to whether the local geology is favourable or not, and the total cost of an 800-ft. dock may amount to as much as £2 million.

The advent of the big tanker in large numbers has made the provision of new docks of appropriate dimensions a matter of urgency, and the investment allowances are being introduced specifically to encourage industrial investment. Up to the present, it has been quite anomalous that a ship-repairing firm, prepared to lay out its capital resources on a project which can be shown to be not merely of business but of national expediency, should be denied taxation reliefs accorded to lesser enterprises.

Certain anomalies yet remain, however; for example, expenditure on drydock excavation work still cannot be considered when calculating the 2 per cent. depreciation allowance. Like any other items of capital equipment, drydocks become obsolescent, and since the end of the war ship repairers have been pressing the Government to recognise this fact and to amend the taxation law accordingly.

Now that the Chancellor has been persuaded that drydock excavation costs are a legitimate subject for investment allowance, he can no longer maintain a logical argument against their eligibility for depreciation allowance. Further, it is illogical to define drydocks as "industrial buildings and structures," in respect of which the depreciation allowance is only 2 per cent. It is surely an equivocation to place drydocks in any category other than "plant and equipment," serving as they do an industrial process as vital as that of any machine.

The Treasury might do well to reconsider the existing taxation law as it relates to the depreciation of drydocks and port works generally.

Burma's Development Programme.

A programme of development planned by the Government of the Union of Burma which involves expenditure amounting to approximately £560 millions during the next seven years was described as "vast and courageous" by the President of the Board of Trade, in a foreword to the report of a United Kingdom delegation which went to Burma in March to obtain first-hand information about the programme.

In the Report are described details of port reconstruction work at Rangoon, for which plans have been drawn up by a firm of consultants in the United States. Since the port of Rangoon does not lend itself readily to expansion, now is the time to plan its future development in relation to the overall requirements of the country, before a start is made on reconstructing wharves which were destroyed during the war.

In order to make the accommodation attractive to shippers and to meet the needs of the country, the plan approved by the Burmese Government, recommends a complete remodelling of the port as follows: rehabilitation and expansion of general cargo wharves, transit sheds and godowns (14 wharves); reconstruction of foreshores; construction of a new rice export wharf, coal wharf and new drydock; reconstruction and improvement of Khans drydock and Dalla wet dock; a new flotilla of harbour maintenance vessels; miscellaneous equipment, workers' quarters and engineering plant.

Under a 10-year development plan, large numbers of inland waterway craft, including tugboats, oil barges and launches, are to be supplied. Ten new paddle steamers of stern-wheeler type, with a draft of about 3-ft., and 150-200 tons carrying capacity are also to be ordered.

The railways are to be rehabilitated, and provided with 31 locomotives and railcars, including six mainline Diesel-electric locomotives. The roads are to be improved and extended, and three hydro-electric power stations built.

Among immediate industrial development projects are the building of ships from 5,000 to 10,000 tons for coastal and ocean routes, and the construction of a new drydock and shipyard with slipways and fitting-out berths.

As the Board of Trade stated, this in indeed a bold programme, dependent for its realisation on the investment of foreign capital amounting to no less than £190 millions—one-third of the total—and to an even greater extent upon the technical skill of foreign engineers and managerial staff.

Port Planning and Operation

Review of Papers Read at I.C.H.C.A. Naples Conference

As briefly announced in the June issue of this Journal, a Conference was held in Naples by the International Cargo Handling Co-ordination Association from 31st May to 3rd June, 1954. During the three days of the technical sessions, a Symposium was presented on "The Ideal Port," when many aspects of port planning and operation were discussed.

For the benefit of our readers, we have arranged to publish in this issue the salient points from a number of the papers. Some of these have undoubted merit; others express views which will perhaps be regarded in some quarters as unauthenticated. Several present arguments which are healthily controversial. To those to whom circumstances tend to give a more or less parochial attitude towards port operation and administration, or who, for one reason or another, may be sceptical of the value of papers on this subject, we would point out that "The Dock & Harbour Authority" now circulates to no less than 83 maritime countries, where the methods of cargo handling and ship working are as varied as the readership of this Journal. As the systems operating in many countries differ so widely, it is surely to the benefit of all that the various points of view should be freely ventilated.

In addition to the fourteen papers summarised in the following pages, six others read at the Conference were:—

(1) The Shipowner's point of view in regard to the Ideal Port, by M. René Courau, President of the Cie de Transportes Oceaniques.
(2) Barry drydock reconstruction*, by L. M. Ramage, B.Sc., A.M.I.C.E., A.M.I.Struct.E., of Maunsell, Posford & Pavry, Consulting Engineers, London.
(3) A new design for an "Omnibus" ship, by Commandant E. Baleine du Laurens and Monsieur P. Legrand.
(4) Cargo Handling in the Port of Beirut, by Joseph G. Mouracadé.
(5) Grain Handling at Marseille, by Ch. Barillon.
(6) Some Labour Aspects of the turn-round of Shipping, by A. A. Evans, Asst. Chief of Industrial Committees Division of the International Labour Office.

We regret that, owing to lack of space, reference cannot be made to all the papers presented. If, however, any readers wish to obtain copies of the originals, we have been asked to say that they can do so by applying direct to the Central Office of I.C.H.C.A., 7, Victoria Street, London, S.W.1.

The Civil Engineer's Problems

By F. A. GREAVES, M.I.C.E., and
P. R. ROBINSON, C.B.E., M.I.C.E.
(Rendel, Palmer & Tritton, Consulting Engineers, London).

The requirements for an ideal port as they affect civil engineers are mainly as follows, and the engineer's problems arise from the necessity for meeting as many of these requirements as possible under very varying natural conditions.

1. Easy access for shipping and protection from waves and weather.
2. Adequate room to manœuvre ships within the port.
3. Minimum of initial and maintenance dredging.
4. Tidal range not excessive.
5. Easy access of ships into berths.
6. Freedom from range or "seiche".
7. Quay or wharf design to require the minimum of maintenance and the construction adequate to allow some impact from berthing.
8. Berth layout should allow for ships of varying draughts and lengths.
9. Quays wide enough to allow both railway lines and road between ship and transit sheds.
10. Adequate provision of transit sheds (*not* storage warehouses) at berths.
11. Open dump areas for non-perishable and bulky goods.
12. Adequate provision of cranes and other mechanical appliances for rapid and efficient loading and unloading of ships.
13. Easy road and rail access from hinterland.
14. Easy road and rail access to berths.
15. Adequate and conveniently sited layout of sorting and main railway sidings.
16. Adequate storage warehouse accommodation clear of cargo handling area.
17. Special berths for bulk cargo.
18. Water, electricity and other services at berths, including water supply to ships.
19. Safety from fire hazard.
20. Segregation of the oil traffic.
21. Provision for small craft.
22. Some repair facilities especially at terminal ports.
23. Bunkering facilities especially at terminal ports.
24. Room for expansion.
25. Minimum of general maintenance.

Any port consists of pre-existing natural conditions and of artificial construction. For a port required to handle a specified type of trade, whether general traffic or one or more special types of goods, much of the artificial construction is necessary, whatever the original natural conditions may be. On the other hand, a considerable amount of the artificial construction—and unfortunately usually the more expensive part—depends almost entirely on the suitability or otherwise to port development of the natural conditions. The existence of a port depends on there being sufficient demand for an outlet for trade, and it follows that ports are not always located where the natural conditions are favourable. The civil engineer may thus have to deal with sites varying from almost ideal natural harbours such as Sydney to open and exposed sites such as Madras or Casablanca. It is in the case of sites with the less favourable natural conditions that the civil engineer's art is most fully exercised. An example of an entirely artificial port on an open coast is shown in Fig. 1, which is the present layout of Takoradi.†

In general, the ideal planning for a port on a river or estuary differs from that for a port on an open or partly open coast, because in the case of a river port development along the banks usually allows greater freedom than in the case of a coastal port, where the whole development often has to be contained within the area protected by artificially constructed breakwaters.

The subject is indeed a large one and has many aspects. In this paper it is intended to limit attention to only some of these aspects, touching lightly in general but with some emphasis on selected items which may be of interest to this conference as a whole as well as to civil engineers in particular.

Turning first to the question of protection of the port from waves and weather, it may be noted that much investigation and experiment has been and is being done on the mechanics of waves and wave action, and this is now much better understood than it was even thirty years ago. It can now be said with confidence that with the present knowledge of wave action, breakwaters can be designed with an accurate knowledge of their behaviour, and that the causes of damage which have occurred in the past can now be foreseen and the probability of their recurrence minimised. Furthermore, the development of the technique of the scale model has furnished a most valuable aid in the design of structures exposed to wave action and in the investigation of silting, dredging, and channel problems; with this aid, projects can now be entered upon with a degree of confidence in their successful outcome, which would previously have been hardly possible. This is a point on which some stress may perhaps be laid, as it may not always be apparent to the non-technical interests in port authorities and other controlling bodies that the time and expense of scale models are usually well justified. An interesting example of the combination of theory and experiment is given by the development of various methods of protection to the seaward face of breakwaters which has been carried on by several laboratories, amongst them the Grenoble Laboratory. One of the most promising of these is the

*An article on the "Reconstruction of Barry Commercial Dock" appeared in the July, 1951, issue of this Journal.

† An article describing the extension works at Takoradi Harbour appeared in the April, 1952, issue.

The Civil Engineer's Problems—continued

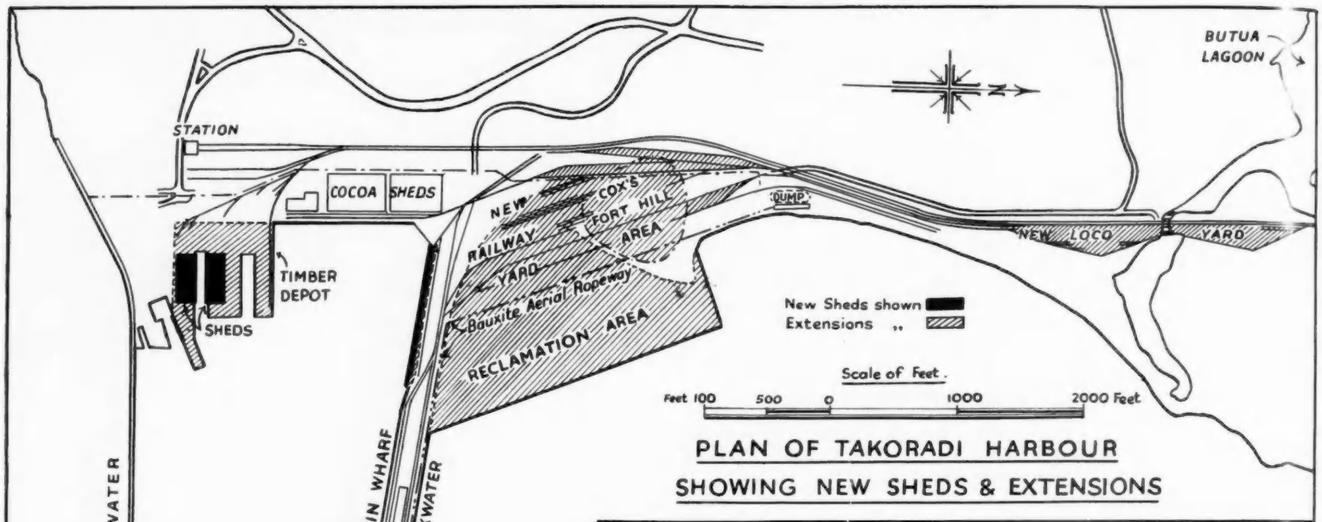
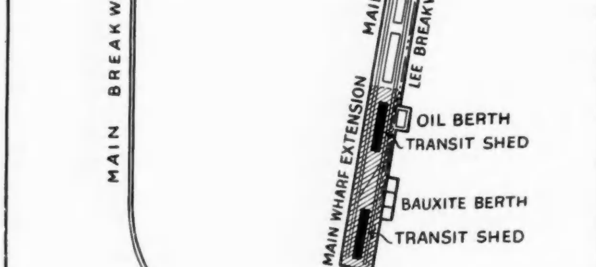



Fig. 1.

tetrapod, which will not only stand at an unusually steep slope under wave action, but is also very effective in absorbing wave energy.

In the consideration of a port development the initial dredging, which is dictated by the natural conditions, is often one of the decisive factors. Very occasionally the engineer can mitigate this problem by training works to divert existing currents so as to deepen shallow water, but usually this is not so. It is nevertheless often possible to reduce the overall cost of dredging by using the dredged material in reclamation, which may not only provide a useful and revenue-producing land area, but may also enable a more satisfactory general layout of the whole harbour to be achieved.

The tidal range has a very great influence not only on the design of quays but also on the layout of the port. Ships can load and discharge at berths with a range of tide up to about 17 feet (5.3 metres); above that figure it is usually necessary to provide locked basins, but these are much more expensive than tidal berths. In the case of a new port, however, where the trade has to be developed, it may be justifiable to provide tidal berths in the initial stages with a range up to perhaps 23 feet (7 metres) until the trade warrants the expense of a locked basin.

" Range " or " seiche " within a harbour can be a serious hindrance to loading and unloading ships, and in severe cases can be dangerous for the ships themselves. The prevention of it cannot be said to have been fully solved, but the probable incidence of range in a harbour of a proposed shape can usually be predicted by model tests, and often the shape of the harbour can be altered in the light of the model information so as to eliminate or at least reduce the range.

Experiments which have been carried out to reduce range in the Port of Madras by compressed air blown from the sea bed show that this method is in fact largely effective, but the volume of air required is very great and the cost of installation and operation is—at least, at present—quite uneconomic. Incidentally, it may be mentioned that American experiments have tended to show that compressed air used in this way might take the place of a solid breakwater, but here again the cost of a permanent protection would be prohibitive. Nevertheless, there might be some future in this method in cases where the traffic would consist only of valuable goods at infrequent intervals.

The initial capital cost of construction of the solid quay wall is now usually so great as to be uneconomic, and present practice favours a skeleton or open type of quay. Nevertheless, the solid wall has much in its favour, despite its initial cost, as it requires little or no maintenance throughout its life. A wharf of the open type is vulnerable to the impact of a ship on berthing and provision has therefore to be made to absorb some of the impact energy by fenders, elasticity of the wharf construction itself, or both. It may be noted that the solid wall creates a water cushion between itself and the ship, which tends to diminish impact.

Various types of fenders have been evolved which will absorb very considerable amounts of impact energy, but many of them are heavy and expensive to instal and to repair. During the last few years large advances have been made in the use of rubber in fenders, and it is now quite feasible to produce blocks of rubber of uniform composition and properties measuring 3 feet (90 cm.) diameter by 3 feet long and capable of absorbing 1,700 inch tons (4,300 cm. tonnes) of impact energy with an elastic compression of 50%. Taking 40% of the total kinetic energy of a ship on berthing as being absorbed by the fenders (the remaining 60% being taken by the ship's hull), it will be seen that the above noted block would bring to rest within 18 inches a ship of 23,000 tons displacement moving at 1 foot per second.

Quay Layout

For maximum utilisation the layout of berths has to be such that they will accommodate the normal size of ship using the port, but at the same time provision must be made for the many smaller ships and some larger ones which will also use the port. Therefore, where the layout provides for a sequence of berths in one line and designed for the length of the normal ship, it is often an advantage if, say, four ships of smaller length can be berthed in the space of three berths. In other words, the loading and unloading arrangements should not in such cases limit the use of the berths to exactly one ship per berth, however small some of the ships may be. This may not, of course, apply to cases where a berth or berths are allocated for full time regular use by a shipping company operating with ships of a more or less uniform size.

The layout of the quays can roughly be of two types, berths on finger jetties and berths in line. There are many attractive features of finger jetties, such as economical use of the available water area in the port, a minimum of dredging, easy access for ships to berths

The Civil Engineer's Problems—continued

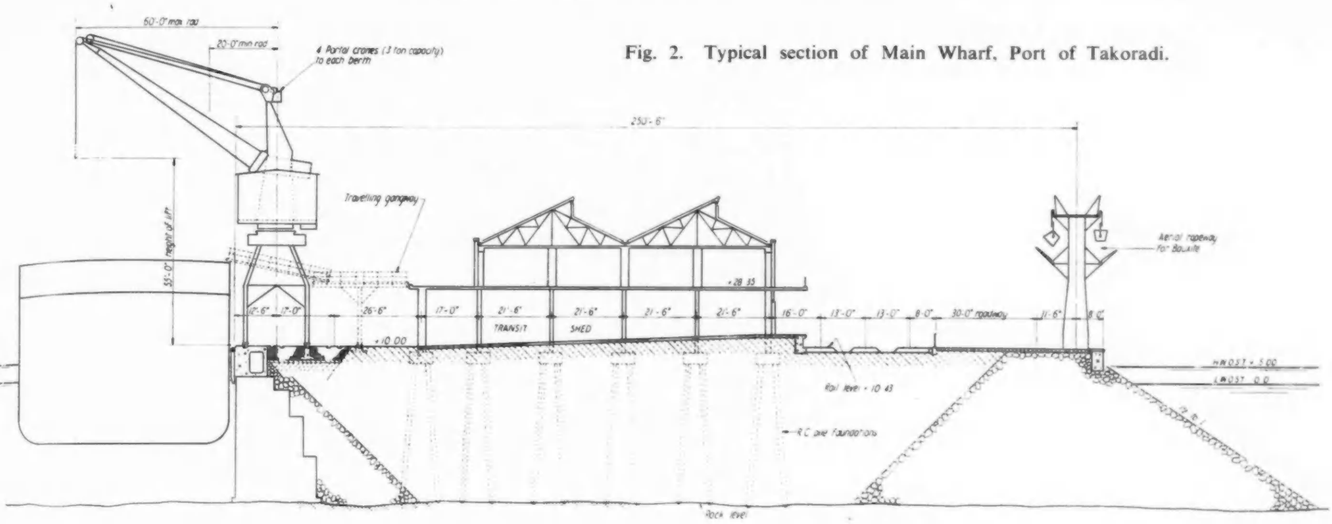


Fig. 2. Typical section of Main Wharf, Port of Takoradi.

and so on, but they have one disadvantage which berths in line need not have, and it is that once the jetties are constructed the area per berth on them available for cargo handling is fixed and cannot be increased to meet possible future requirements of increase in trade or change in volume of traffic except by reconstruction of the whole jetty system. Further, it is difficult to give rail access on to finger jetties without using sharp curves, which is disadvantageous where rail traffic is at all considerable.

Thus, where the finger jetty system is adopted, the initial layout should provide sufficient width on the jetties themselves for transit sheds, open dumps, rail and road access, etc., for the quays on both sides of the finger jetty and allow for such increases in the requirement for cargo handling area as can reasonably be anticipated, and sufficient space between the jetties to allow for some increase in the beam of ships.

Where there are two or more berths to a side of a finger jetty, the space between jetties should allow a ship proceeding to or from an inner berth to do so without interfering with ships lying at outer berths; if part of the cargo is handled by lighters, this also should be borne in mind in deciding the space between jetties.

In almost all ports some part of the cargo is handled by lighters and not direct from ship to quay. Where such lighter traffic is considerable, special lighter berths should be provided, equipped with cargo handling appliances. It may be noted that circumstances may warrant the handling of most or all of a cargo by lighter from a ship at moorings.

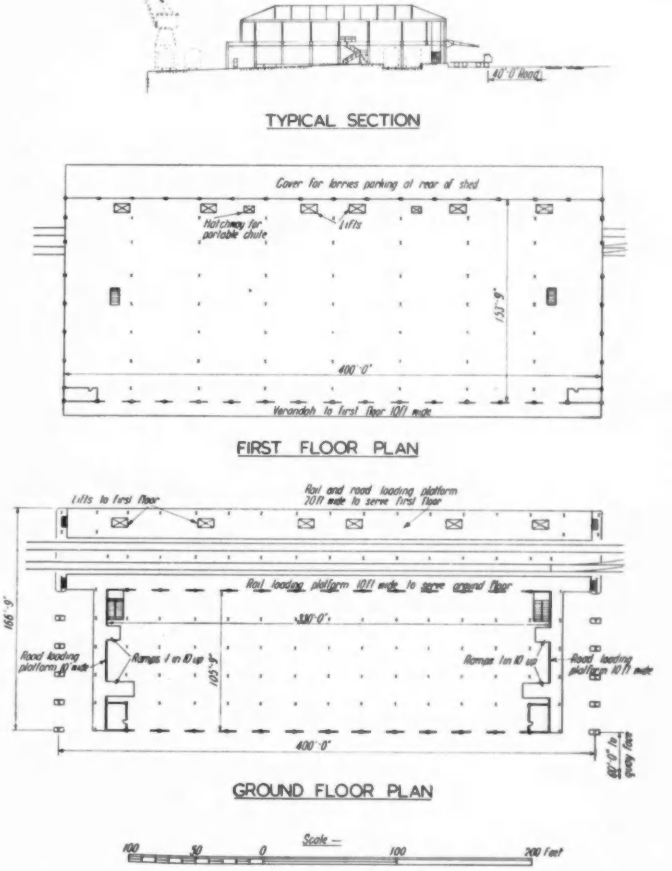
The lighter or barge traffic may be very considerable in ports connected to an inland canal system and special arrangements may be necessary in such cases.

Although it is not always the American practice to allow space between the quay side and the transit sheds, the general European practice is to do so, the difference in custom being largely due to whether cargo loading and unloading appliances are supplied on the quay side or whether reliance is placed on the ship's derricks. This is a vexed question and will not be discussed here, except to say that the use of ship's derricks becomes progressively more difficult as the tidal range increases. In European practice the tendency is to increase the width of quay between ship and shed, and a width of 35 feet or, say, 10 metres, which would have to be considered adequate in the past would, by modern standards, be considered far too small.

Almost all general cargo ports are served by road and rail, and often a large part of the traffic consists in large rail and road consignments of a particular type or types of cargo which can conveniently be handled without passing through the transit sheds. Direct loading and unloading between ship and rail or road is best in such cases, and the width of quay must be enough to permit it. This applies not only to traffic with the hinterland, but also to some extent to traffic to and from the storage warehouses. For an appreciable volume of such traffic, the modern trend is to have at least two and preferably three lines of rail track on the quay as well as room for road traffic; one of the rail tracks should act only as a running line and the remainder as standing lines for cargo handling. A point which is sometimes overlooked is the desirability of sufficient space between at least two of such rail tracks to allow the use of cargo nets or pallets without interruption to traffic on the adjoining line.

While perishable and ordinary packaged goods must almost always proceed to and from the transit sheds, there are many types

Fig. 3. Proposed Transit Sheds, King George's Dock, Calcutta.



The Civil Engineer's Problems—continued

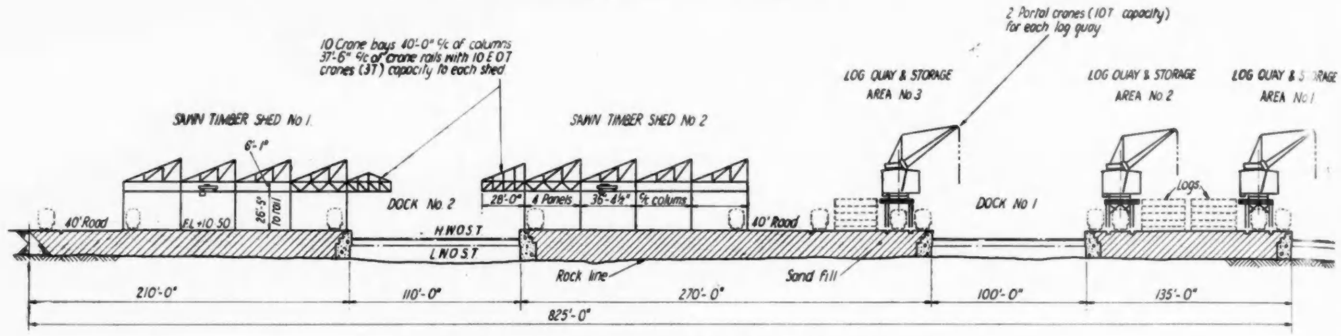


Fig. 4. Section through Timber Depót, Port of Takoradi.

of cargo which are either too bulky to pass conveniently through a shed or are not perishable. Open dump areas behind or between transit sheds are very useful in handling this type of traffic, and should be sited between each berth so as to minimise the trucking distance between dump and ship.

For the rapid clearance and loading of goods, easy rail and road access to the front of the transit sheds is necessary as well as to the rear of the sheds. In general, where there is a number of berths in line, separate rail and road access should be provided to both quay side and rear sheds at intervals not exceeding every third berth, as otherwise there is apt to be congestion at the access end. Similarly, an adequate arrangement of sorting sidings is necessary, but it is not essential that these should be close to the berths they serve, provided that they are not more than, say, half a mile or rather less than a kilometre away. Also similarly, the area occupied by storage warehouses can be an appreciable distance away from the berth area, and indeed it is an advantage to keep it entirely segregated.

The Design of Transit Sheds

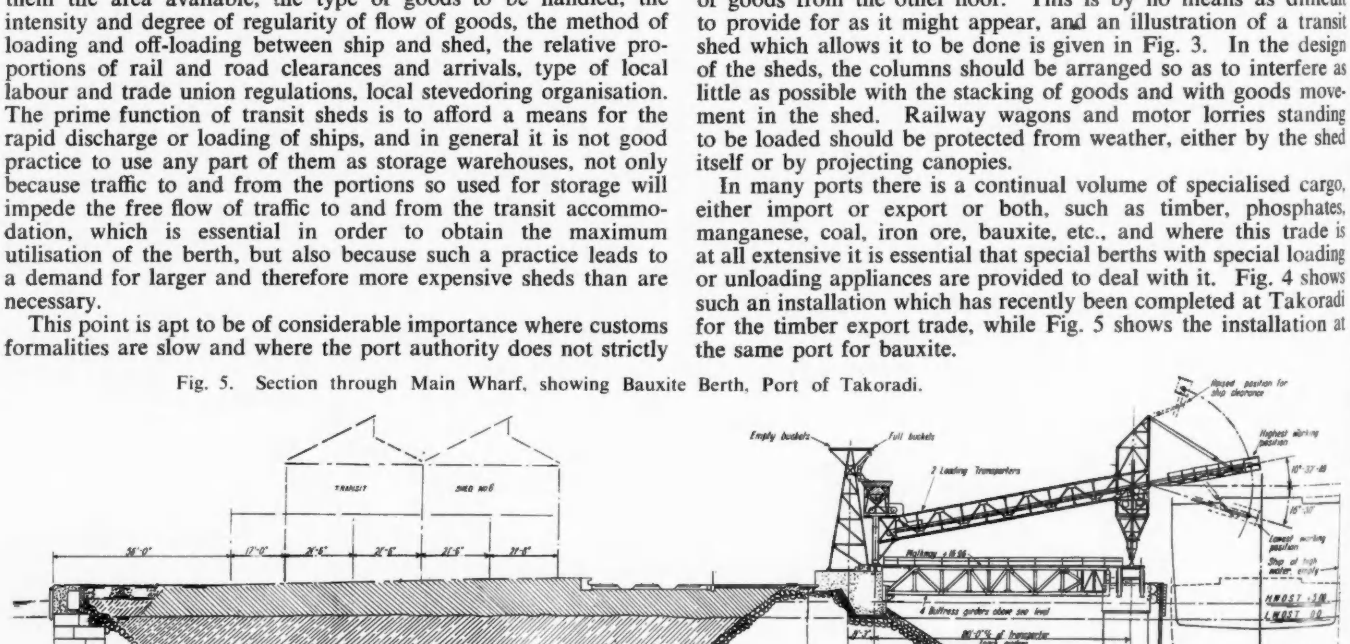
Transit sheds can be of various types, and the design adopted for any particular port depends on a number of factors, among them the area available, the type of goods to be handled, the intensity and degree of regularity of flow of goods, the method of loading and off-loading between ship and shed, the relative proportions of rail and road clearances and arrivals, type of local labour and trade union regulations, local stevedoring organisation. The prime function of transit sheds is to afford a means for the rapid discharge or loading of ships, and in general it is not good practice to use any part of them as storage warehouses, not only because traffic to and from the portions so used for storage will impede the free flow of traffic to and from the transit accommodation, which is essential in order to obtain the maximum utilisation of the berth, but also because such a practice leads to a demand for larger and therefore more expensive sheds than are necessary.

This point is apt to be of considerable importance where customs formalities are slow and where the port authority does not strictly limit the consignee to a fixed time for free transit storage. There appears to be little or no justification for the tendency observable in some ports to demand larger transit sheds on the grounds of increased time taken in post-war years in customs formalities and other transactions in the clearance of goods. Such delays are largely unnecessary, and where berths are used to capacity must eventually result in a reduction in the number of ships per berth per year. Fig. 2 shows a typical cross section through quays and transit sheds at Takoradi.

Some of the factors noted above impose an upper limit on the width of a transit shed, and it is often found that transit storage volume required is greater than can be provided with a single storey shed. Two or even multiple storey transit sheds are therefore common, and for their efficient use the flow of goods to and from the upper storeys must be well provided for by lifts and goods chutes. It may also be noted that where transit sheds are of two storeys, quayside cranes greatly facilitate their efficient use. Where goods flow to and from the shed both by rail and road, separate rail and road loading bays should be provided, because if not, clearances by rail are held up by lorry loading and vice versa. Furthermore, for the best use of the shed, goods proceeding to and from either floor should be able to do so without crossing the flow of goods from the other floor. This is by no means as difficult to provide for as it might appear, and an illustration of a transit shed which allows it to be done is given in Fig. 3. In the design of the sheds, the columns should be arranged so as to interfere as little as possible with the stacking of goods and with goods movement in the shed. Railway wagons and motor lorries standing to be loaded should be protected from weather, either by the shed itself or by projecting canopies.

In many ports there is a continual volume of specialised cargo, either import or export or both, such as timber, phosphates, manganese, coal, iron ore, bauxite, etc., and where this trade is at all extensive it is essential that special berths with special loading or unloading appliances are provided to deal with it. Fig. 4 shows such an installation which has recently been completed at Takoradi for the timber export trade, while Fig. 5 shows the installation at the same port for bauxite.

Fig. 5. Section through Main Wharf, showing Bauxite Berth, Port of Takoradi.



The Civil Engineer's Problems—continued

Protection from Fire

Safety from fire risk has not always been given all the attention which is desirable, as is evidenced by the disastrous fires which have occurred at certain ports. A considerable amount can be done in this direction by the design of buildings to modern standards and by the installation of sprinklers and other fire preventive appliances, but the matter should also be borne in mind in the general layout of the port area. For example, the petroleum trade carries a continual fire risk; where such trade has to be included inside the general port area, not only should it be segregated from the rest of the port to minimise the risk of spread of fire by land, but also means should be provided for preventing oil spilled on to the water from spreading into the rest of the port water area. In the case of an estuarial port, the segregation can usually be obtained by locating the oil berths on a separate site nearer the mouth of the river than the general cargo berths, and in the case of a harbour of limited area or an artificial harbour, it can be obtained by floating fire booms.

Oil ports are more or less of a special nature, and the layout of berths in them is usually different from that of a port handling more general cargo. Nevertheless, the same general principles of protection from weather, manœuvrability of ships inside the harbour and so forth, apply equally well to oil ports. It may be noted that in oil ports the safe distance between parallel berths is dictated by the fire risk, particularly where crude oils or oils of low flash point are handled, and in British practice a minimum distance of 100 feet between ships at parallel berths is adopted.

Finally, in considering the question of future expansion, it may not always be apparent how much the development of a particular part of a port area may cripple future development. This can result not only from actual construction by the port authority, but also from such things as letting port lands on long term leases, or the disposal of land by sale. The authors have in mind a case where action of the latter sort has practically tied down the future development of the port railway system to curves, which are already too sharp for the new port rolling stock. It should be stressed that all developments in a port must take place within the general framework of a master plan. Such a master plan, once drawn up, should not be altered in its general lines without the most serious and careful consideration, though variation of detail within its framework to provide for the change from time to time in the specific requirements of the port is not only permissible but desirable. It should not be part of a port chief engineer's duties to feel it necessary to produce a fresh general development plan each time there is a new incumbent of the post.

In the discussion which followed, Mr. Robinson was asked his views on the question of single storey versus double storey transit sheds. He said that wherever possible the former was advocated, the reason being that it was obviously uneconomic to raise merchandise to an upper floor and let it down again unless absolutely necessary.

"This general remark does, however, require qualification, and as a starting point I will assume that the berths are used regularly and fully.

"Transit sheds should be able to accommodate the maximum amount of a ship's cargo to be unloaded, plus the maximum amount of a ship's cargo to be loaded. Thus, in the case of a terminal port, the total accommodation required may be as much as one full ship's cargo of import goods and one full cargo of export goods.

"In general, the transit shed should not occupy a greater length along the quay than the length of the berth it serves, because otherwise there is liable to be uneconomical cross trucking inside the shed. Also access to open dump areas, which are usually sited behind the transit sheds, should be short in order to avoid uneconomical length of haul from ship to dump, and this also limits the length of transit sheds, as it is undesirable that goods going from ship to dump or vice versa should have to travel around the end of a long line of sheds.

Berths are designed to take a certain sized ship for normal use, for example, if the tonnage of the normal vessel using the port is about 12,000 tons, the length of berth will be 500 to 600 feet. It follows that the length of a transit shed serving a berth is fixed within certain limits. The storage area required in the shed is decided by the cargo to be handled, both in type and in amount, as I have mentioned earlier. The width of the shed from back to front cannot be increased indefinitely, even if there is sufficient ground area to do so, because beyond a certain limit increased width results in uneconomic handling inside the shed. A width of about 150-ft. (50 m.) is reasonable. It follows from this, that if the area required for transit shed accommodation, fixed as mentioned above, cannot be got on one floor, two or even more storeys may be used. Where this is the case, and where dockside cranes are employed, it makes for efficiency if the upper floors are used for import cargo and the lower floor for export cargo."

Ideal Port Administration

By B. NAGORSKI
(U.N.T.A.A. Port and Shipping Expert in Jordan)

No uniform pattern for a best possible form of administration can be designed for all ports of the world. On the contrary, diversity rather than the uniformity is and must be the prevailing rule. Local natural conditions, ownership of various port installations, long-established traditions and habits, are so many factors which have led to a great variety of port administrations, state controlled, autonomous, municipal or private.

Maritime ports are one of the most important links in the chain of economic development of the countries in which they are located. They are gates to the outer world, they open access to world markets and make possible international exchange of goods on a scale otherwise unattainable. In many cases, they are real keys to a country's prosperity.

It is only natural, therefore, that with development of international trade and with radical modernisation of methods of production and commerce, maritime ports had to be revitalised and adapted to the fast pace of all present economic processes. It was not sufficient to improve, expand and modernise port facilities and port equipment; management and administration had to be modernised too.

In spite of the diversity of various systems, it appears possible to formulate a few basic principles on which an efficient modern port administration should be built. In my opinion these basic principles are:—

1. Autonomy.
2. Financial independence.
3. Authority over whole port area and over all main port functions.
4. Commercial Management methods.

1. **Autonomy:** The most essential condition for an efficient port administration is an as high as possible degree of independence from general public administration services. The management of a maritime port should be entirely independent of political trends in general Government administration. It should be in hands of personnel selected in accordance with professional skill and managerial abilities of individuals concerned and not with their political affiliations.

This principle should be followed irrespective of whether the port is owned or controlled by the Government or by a Municipality. Municipal administration, although often less cumbersome and bureaucratic than government administration proper, is still subject to unavoidable fluctuations of political and social trends and lacks the simplicity and cohesion of an industrial type of management. Even for a port owned by private interests, such as a private railroad company, establishment of a Port Authority might be indicated, this time for a different reason; namely for safeguarding of public interests which sometimes might not be quite identical with the short range interests of private owners.

Ideal Port Administration—continued

In accordance with prevailing practice, a Port Authority should be a body entrusted by the owners of the port, state, municipality or else, with the current administration and development of the port, within the limits of a public law or other legal act by the virtue of which the Port Authority has been created. Only a quite general over-all control should be exercised by the State or the Municipality, while the Authority should have a free hand in all current matters, unhampered by complicated regulations applying to most governmental or municipal services. Port Authorities should be composed predominantly of representatives of commercial interests and members of the Board should be selected among port users, such as ship-owners, stevedoring contractors, importers, exporters and shippers. It is a good practice to have on the Board not only representatives of the cities in which the port is located but also of the hinterland for which the port is working.

2. **Financial Independence:** One of the main stumbling blocks on the way to full autonomy for many ports is the difficulty of achieving financial independence. Whoever supplies the funds, will have unavoidably the tendency of exercising a strict control on expenditure and therefore on management of the port. The aim of every port administration should be therefore to achieve financial independence, that is, to cover its expenditure from its own revenue. Only then will the Port Authority be really master in its own house.

So far as ordinary expenditure is concerned, it should be possible in most cases to cover such expenditure from current revenue, provided a reasonable system of port tariffs is in force. Excessive tariff rates must of course be avoided, but, on the other hand, it should be kept in mind that port users derive much more benefit from efficient services than they would from very low port tariffs. Saving of one day in the turn-round of a vessel often means more for the owner in terms of money than the value of port dues paid for the entire call to the port. It appears desirable also that each particular service of the port administration be financially self-sufficient.

A more difficult problem is connected with financing capital expenditure for building entirely new port facilities, especially so channels of access to the port, locks and similar major maritime structures. In many cases, right-out donations of governments concerned are the only means to meet such expenses. However, a system of long term loans, with a low interest rate, guaranteed by port revenues, perhaps with an additional State guarantee, can often be successfully applied by a Port Authority, in particular for building of revenue bringing facilities within the port proper; amortisation and interests to be covered from current income from port dues.

3. **Authority over whole port area and all main port functions.** It is essential for the efficiency of port operation, that a maritime port be managed as a unit instead of being split into separate parts under different jurisdiction. Allocation of berths to regular steamship lines and to tramp vessels, division of the port into specialised zones according to nature of traffic (general cargo, bulk cargo, petroleum products, etc.), planning for future expansion, cannot be made properly unless the port management has full control of all quays, wharves or piers and of still undeveloped water frontage within the port area. Divided ownership of various port facilities makes it difficult in many cases to achieve this ideal state of affairs. Pooling of all facilities under one overall authority should, however, always be the ultimate aim.

It is also desirable that Port Management should exercise control over ship movements in the navigation channels within the port area as well as in docks and on all waters; provide service of harbour pilots and navigation police; control facilities on shore, transit sheds, open storage space, cranes, roads or tracks on wharves, etc.; be responsible for maintenance of navigation channels, quays, wharves, dolphins, locks and other maritime structures as well as transit sheds, cranes and facilities on shore; take care of improvement or extensions of any port facilities on land and on water.

It is not recommended, however, that a Port Authority should perform purely commercial functions within the port, and particularly physical work of handling cargo. In my opinion, commercial activities, such as stevedoring sampling, customs clearance, forwarding, trucking, etc., should be left to private contractors, on a free competitive basis.

4. **Commercial Management Methods:** Once a Port Authority is established along the above lines, with a great degree of autonomy and financial independence and with control possibly over the whole port area and main port functions, the success will depend to a large degree on the system of management. There appears to be no doubt that a bureaucratic system as of necessity applied to basic governmental departments is of no value for a port aadministration. Instead of rigid governmental rules and regulations, elastic methods of industrial management should be applied to such a living and changing complex as a modern port.

The first big difference is in financial administration. A Port Authority should have full power to increase operating expenses whenever traffic requires and revenues permit. It should also have authority to increase or lower various port charges, especially for specific services like use of cranes, storage or pilotage. Basic dues on vessels and cargo are in general subject to a certain degree of supervision by governments, but even here a Port Authority should have a wide latitude of freedom to make various adjustments in order to meet competition of other ports, to correct iniquities, to attract new traffic and new steamship lines, to promote transit, to encourage calls for bunkers and to take full advantage of any new opportunities that may suddenly arise.

An important difference, from financial point of view, between a port administration and a purely commercial undertaking is the fact that a port is not and should not be a profit making proposition. It should be financially self-supporting, whenever possible, for the sake of better efficiency, not for the sake of profit making. But otherwise the methods of financial management should follow the pattern of private companies rather than of Government Departments.

Another field on which bureaucratic system of Governmental Departments should not be followed is the personnel policy. Officials should be selected, promoted and paid according to their merits and not according to the rigid scale of salaries. Individual officers should have a great degree of authority and freedom within the scope of their responsibilities, instead of having their hands tied by a maze of regulations. In accordance with successful practice of most private corporations, top management should be concentrated in the hands of one chief executive, in his own manner, in accordance with a general policy approved by the Board and as long as he enjoys full confidence of the Board.

An important aspect of commercialised management is the port promotion activity. Port management should not sit and wait for the traffic to come but make all conceivable efforts to attract traffic. Publicity agencies in important centres of production and commerce in the hinterland, close contacts with shippers and with steamship lines, watching of the flow of traffic to competitive ports are some means of active port promotion and of good salesmanship. None of them should be neglected, if a port is to be successful.

Conclusions: It should be emphasised once again that in most cases it is not possible to implement all the above recommendations nor to achieve a full unity of control and full administrative independence of a port. Many of the greatest and most successful ports, including the biggest of them all, the port of New York, are far away from the pattern of an ideal port administration. In New York, ownership of the water front is split between two States, several municipalities, and private corporations. Main port functions are divided among Federal agencies, State Governments, municipal offices and an interstate Port Authority. However, if the port is successful it is not because of this highly undesirable organisation but in spite of it. Excellent natural conditions and unparalleled economic wealth of the surrounding area with 11 million inhabitants within the limits of the greater city itself are sufficient to make New York the biggest port of the world and also the most difficult to be managed as one complete unit.

Nevertheless, the principles of autonomy, financial independence, concentration of responsibilities and elastic commercial management, should be the guiding motives for improvement of port administrations. For smaller and medium size ports it appears easier to approach this tentative picture of an ideal port administration, but for all ports, big or small, the nearer they come to the ideal, the more chances they will have to be efficient and successful.

Loading and Discharge of Goods in regard to Regular Shipping Lines

By Dr. MARIO BENIFEI
(Maritime Section of The Chamber of Commerce, Genoa)

Quay installations are of particular importance to the loading of ships belonging to regular shipping lines. Valuable merchandise is now often despatched by fast passenger liners which offer all modern amenities, even for specialised goods; but speedy means of transport demand equally fast port facilities for loading and discharge.

Although many ports already have such arrangements, it is time to evolve a general scheme to be embodied in the construction of new ports, or to modernise existing ports where the volume of passengers and goods warrants such action in the common interest of both the traffic and the ships.

Modern equipment, in order to be best utilised, must be allied to a scheme of tariffs which avoids too big a difference between the costs of handling goods shipped via shed or warehouse and those despatched direct to the quayside. In certain ports this difference is considerable, so that the consignor prefers the "direct" system of loading. This often causes congestion in the handling of goods which arrive at the quay at the last moment, thus increasing the possibility of loss and damage to packages, preventing any ordered system of stowage on board and making customs formalities difficult.

Further difficulties often arise from the habit adopted by certain exporters of waiting until the last minute before sending their goods to the port, to the accompaniment of the stream of pleas and exhortations that their goods should not be left behind. All this, quite naturally, increases the difficulties of those in charge of loading operations who wish both to satisfy the exporters and not to delay transport of the goods to their destination.

Moreover, loss of time and heavy costs are often caused by hurried and disorderly stowage of goods loaded in preceding ports; so that quite often it is necessary to shift the cargo in the holds in order to sort out the goods for discharge and to make room for those to be loaded.

In certain ports, considerable delays are due to the requirements of the Customs authorities for delivery and inspection of documents. At the time of loading these requirements are governed by the rules concerning export permits and, even if carried out with speed by the Customs officials, can often delay goods arriving on the quay by methods of transport which are nicely calculated to coincide with the time of the ship's stay in port.

Sometimes the working hours of the port labour force—even if these should coincide with those of the Customs authorities—may slow down operations from the start, for very often gangs ready for work have to wait until the Customs authorities have given them the go-ahead.

It is desirable, therefore, to have some sort of relation between the time schedule of the Customs and that of the labour force, so that goods may be ready for shipment immediately they are required.

It is necessary to stress that these observations with regard to Customs formalities refer chiefly to those ports where direct shipment is still the principal method; because where the opposite is the case—i.e. where the goods are usually despatched by way of the port transit accommodation—Customs officials have sufficient time for all the necessary formalities. Thus the rhythm of operations can be speeded up.

To end this brief summary, the following recommendations should be borne in mind. They will apply, of course, only to those ports where the delays we have just mentioned occur:

1. To construct, where possible, modern transit accommodation close to the berths reserved for commercial shipping lines.
2. To spread as widely as possible the idea that maritime stations, which allow of the speedy embarkation and disembarkation of passengers, are a necessity in all ports where big passenger liners call.
3. To study a system of tariffs which would abolish completely, or even in part, the difference in cost between direct shipment and that by way of the port premises.
4. To convince exporters and consignors that they should despatch their goods by way of transit sheds so that Customs and loading operations may be easier and more orderly.
5. To regulate, where possible, the working hours of the Customs officials in relation to those of the port.

What we have just said may have a limited value according to the ports concerned; but with regard to the general circulation of traffic it is very important, because by speeding up loading and unloading operations—even in usual ports of call—we are working not only in the interests of the ship but also in the interests of a more uniform and economic system of tariffs.

Ship Installations Contributing to the Improvement of Cargo Handling

By PIERRE L. BAIN
(Ingenieur Civil du Genie Maritime)

Since the last war there has been an important increase in the speed of ships which has not been accompanied by a similar increase in the speed of turn-round in port. It is said that the cost of handling general cargo on board now represents 50 per cent. of the total expenses of running the vessel and if this is so, the value of any effort to reduce this percentage is obvious.

Experience has shewn, however, that the desired improvement cannot be achieved without a practical knowledge of the question and a critical observation of methods usually employed. As far as special cargoes are concerned—i.e. bananas, coal, ore, grain, etc., the problem has in the main been solved by constructing specially-designed ships. For ordinary general cargoes, however, the solution has yet to be found.

As a contribution to the solution we propose to examine certain modern improvements connected with the ship itself, which are either under consideration or are being in part employed. They are (a) watertight metal hatch covers inside shelter 'tween decks; (b) portable 'tween decks for single decked vessels and (c) bipod masts.

I. Watertight Metal Hatchcovers on the Weather Deck.

These are well known, having already been fitted on more than 1,000 vessels of many nationalities. The principal benefit expected to accrue is an important saving in the time occupied by opening and closing hatchways. The conventional small, separate hatch-covers, with supplementary tarpaulins, of the ordinary general cargo vessel require so much time to manipulate as to be incompatible with modern shipworking needs.

Other advantages accruing from the use of water-tight metal hatchcovers include:

Covering and uncovering holds can be done by the crew instead of by dockers.

Reduction in overtime payments to crew.

Reduction in maintenance costs.

Increased protection to cargo, more particularly on small ships with exposed forward hatchcovers.

The possibility of loading heavy packages on the hatch covers themselves.

The possibility of stowing deck loads abreast of hatchways without hindering the uncovering and covering-up operations.

The elimination of hatchway tents.

The increase in the safety of the ship, resulting from the watertightness of the covers.

The supplementary protection offered in case of fire in the hold.

II. The Watertight Metal Hatchcovers of Flush Type on the Main Deck under Shelter Deck.

International safety regulations require that coamings of hatchways on the main decks of a vessel having shelter decks must stand 9-in. above the deck. In rare cases $2\frac{1}{2}$-in. coamings are permitted and this arrangement applies to watertight steel hatch covers not using tarpaulins.

Ship Installations Contributing to the Improvement of Cargo Handling—continued

As is well known, these coamings form a considerable hindrance to the stowing of goods and also to the employment of mechanical handling appliances on the deck in question.

The provision of the flush type of cover would solve these problems, provided it is strong enough to be loaded with cargo and is constructed to allow the opening, if necessary, of only part of the hatch in order to enable work to be done simultaneously from the lower hold and the 'tween deck.

In France, since 1952, six ships of 1,700 to 8,000 tons have been equipped with flush deck covers. Other ships have been similarly fitted recently in England, Holland, Italy and Spain.

III. **Portable Decks or "Extra Deck"** (Fig. 1).

The idea which led to the conception of the portable or extra deck is that certain types of ships designed for the transport of bulk cargoes, that is to say, having deep holds, are limited in their carrying capacity, when the type of freight for which they were constructed is not available.

The portable or extra deck may be constructed in two different ways.

The first method consists of providing extra deck sections hinged on pillars or brackets to the inside of the hold at each side of the ship. Generally, these sections are not sufficiently wide to meet at the centre line of the ship and the space which remains between them is filled in by end-rolling steel hatch covers.

The second method has not yet been put into practice. The proposal is to avoid the difficulties (of strain etc.) of the pillar or bracket means of support, by installing in the holds lateral sections along the ship's side but not supported by pillars or brackets.

Calculation shows that the fixing direct of such sections to the ship's side will produce stresses of a prohibitive nature.

To get over this difficulty, it is proposed to fix along the ship's side, between the two end bulkheads of the hold to which it is attached, a steel caisson called "Torsion Caisson," forming a strong stringer. It is upon this caisson that the sections would be hinged.

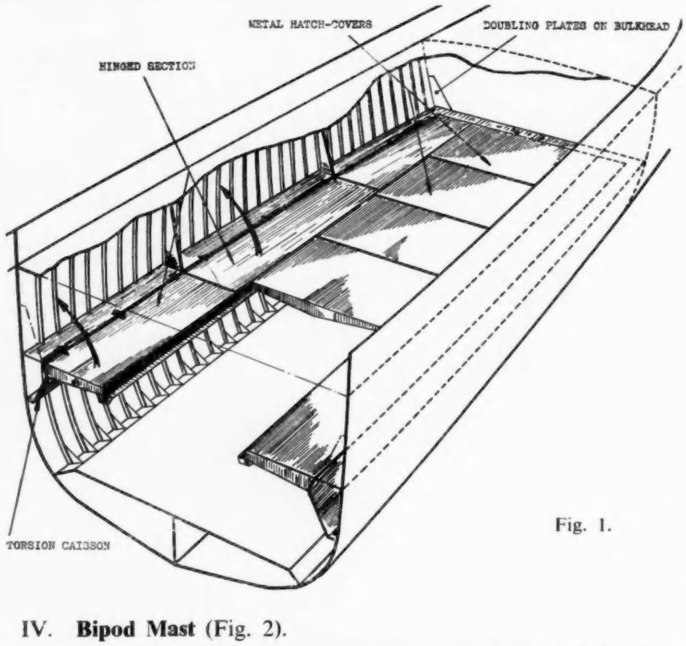


Fig. 1.

IV. **Bipod Mast** (Fig. 2).

The principle adopted in masting a ship has remained the same since the days of the sailing vessel. Modifications have been made, of course, and there have been deviations, such as "goal post" masts.

An advance on the old principle is thought to be achieved by the "Bipod" mast, which has already been installed in more than a hundred ships of various nationalities.

The essential feature of this mast is that it does not have shrouds or stays. It is made of two tubular girders assembled together by means of a gusset at the masthead. The angle formed by the two girders is about 20°.

The Bipod mast weighs some 15 per cent. to 25 per cent. less than the conventional mast but, as stated, its main advantage is that it leaves the deck clear of obstruction, thus enabling the ship's derricks and more particularly the shore-based cranes to have maximum freedom of action. It also reduces maintenance costs to a minimum.

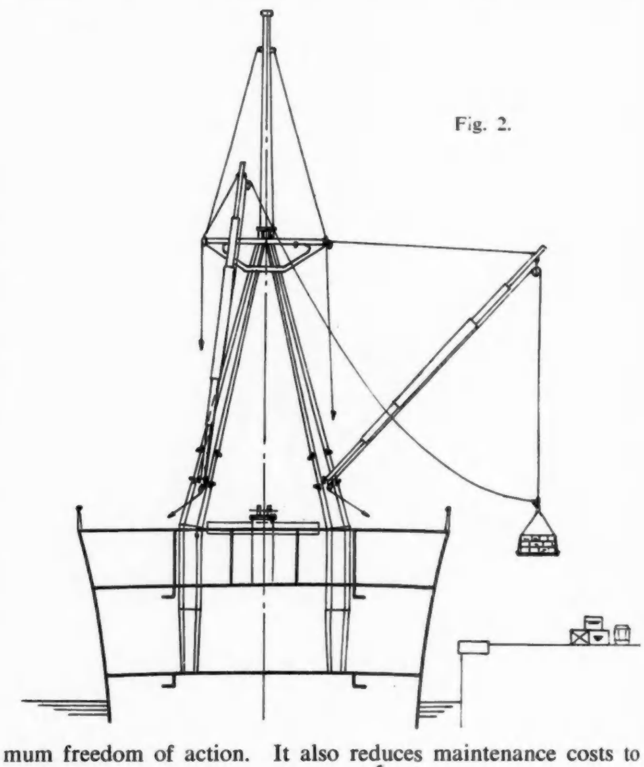


Fig. 2.

Conclusion.

The foregoing remarks shew the importance that certain improvements to ship installations may have, even though at first glance they may not seem closely connected with the problem of the quick turn-round of ships. It is appreciated that the arrangements described do not solve all the problems in this particular sphere and that there is still much progress to be made.

This progress, however, cannot be achieved without the close co-operation of all interests in the industry—and I.C.H.C.A., by its organisation, is well placed to bring such co-operation about.

Increased Lift of New Floating Dock.

A new dock, which has a lifting capacity of 28,000 tons and can accommodate vessels of up to 45,000 tons deadweight, has been built for the owners, Götaverken, A/B., Gothenburg, Sweden, by Jos. Boel and Sons, S.A., Tamise, Belgium. The dock has been built with ten pontoons and two continuous side walls. By omitting the tank top from the side walls it has been possible to save a considerable quantity of material and simultaneously increase its lifting capacity. A system of electrodes have been installed to ensure that the water in the tanks will not rise above a certain level by closing the inlet valves automatically when this level has been reached. The side walls have two decks, one for two 12-ton cranes, the other for manoeuvring labour, materials, etc. The principal dimensions are as follows: length overall, 713-ft. 10-in.; breadth, 132-ft. 9-in.; inside breadth at entrance, 100-ft.; height of walls above pontoon deck, 39-ft. 4-in. Work on the dock will be completed by the owners, who will then possess three floating docks with lifting capacities of 28,000 tons, 18,000 tons and 8,000 tons respectively.

Mobile Plant for Cargo Handling.

By JAMES STEEL

In the course of his paper*, Mr. James Steel defined Mobile Plant as plant which is easily and speedily moved; ease and speed are the essence of mobility. It may be required to move:—

(a) From one port to another, as, for example, from a summer port which is frozen in winter to a less convenient but open port.

(b) Within the port area from piers and wharfs to sheds and re-handling areas.

(c) From shore to ship and within the holds.

Usual practice was to bring a ship to the berth at which suitable handling plant existed. This meant delaying a ship when the particular berth was not available, or moving a ship from one berth to another. Modern practice was to move the loading or discharging plant to the ship's side which had two great advantages: no ship was then delayed whilst any berth was available, and every berth was used to the maximum. Every bulk-handling plant could be mobile.

The objects of good cargo-handling could be listed as: (1) Speed, (2) Safety, and (3) Lower Cost.

To achieve maximum advantage from modern plant, however, it was necessary to use the same type to discharge a cargo as to load. It was also essential for site conditions to be suitable for the use of mobile plant in respect of: good concrete roads, flush rails, easy gradients, wide doors, absence of pillars in sheds.

Fixed and semi-mobile cargo-handling plant had been expressly designed for port use and were ideal for their purpose. Unfortunately, most items of mobile plant had been designed for use in steel mills, timber yards, automobile factories and other industrial units without having regard to the special requirements of the stevedoring industry. Only the mobile cargo crane and a special load-carrier truck, the dock truck, had been designed for cargo-handling. Whilst, therefore, mobile handling plant was already playing a great part in reducing the costs of cargo-handling and speeding the turn-round of ships, there was little doubt that it would be of yet greater value in ports if it was designed expressly for this purpose. Manufacturers would be willing to design and produce machines specially for cargo-handling if the industry could specify its needs categorically and unanimously. Unfortunately, however, every Port Authority in every country had its own ideas about the size and power and specification of different items of mobile plant.

Mr. Steel suggested therefore that I.C.H.C.A. should give the lead to Port Authorities throughout the world in establishing standards and achieving a degree of uniformity in the design and specification of mobile plant. If a sufficient number of operators subscribed to these opinions, then undoubtedly manufacturers would produce machines better suited to cargo-handling than have hitherto been available.

Members had asked whether the Association could suggest a standard factor for assessing the capacity of any mobile crane. In common usage is the practice of quoting the capacity in radius feet × tons lift at that radius, i.e. a lift of 6 tons at 10-ft. radius is quoted as 60 foot-tons. Several other factors must be taken into consideration: hoist speed; the number of falls of rope; stability; centre post load; tyre and jack loads; jack centres; the breaking strain of ropes; the crippling load of the structure.

All U.K. mobile crane manufacturers would shortly quote maximum duties at 3 m. radius; this was an excellent radius to select for any but the biggest cranes, as it provided a clear outreach on most models of about 2 metres which permitted the handling of loads of about 4 metres width.

In conclusion, Mr. Steel suggested that I.C.H.C.A. should form a panel representing the chief maritime nations of the world to establish definite standards for mobile plant in ports. If Port Authorities could also through this medium express their requirements to manufacturers, entirely suitable machines would be designed and produced to meet their most exacting needs.

* An article by Mr. James Steel entitled "Cargo Handling at Ports," which covered much the same ground as the paper presented in Naples, appeared in the May, 1954, issue of this Journal.

Modern Quay Installations in Ports

By CANTIERI RIUNITI
(Dell' Adriatico, Trieste)

At the end of the war, shipowners of the principal European nations were faced with the problem of how to construct their new merchant fleets and when bigger and speedier ships were built, noticeably quicker turn-round was obtained.

However, port installations are just as important as ship design and a port is liked not only because of its lower charges but also for its rapidity in dealing with cargoes. Much work can be done by ships' winches and in the newly designed ships, their numbers were increased and the power and speed augmented.

This was only a part solution to the problem of speeding discharge and loading, so port authorities turned their attention to the quay crane.

The number of cranes which may be used in discharging a ship obviously depends upon her length and number of hatchways. This emphasises the point that quay cranes must be built in such manner that their concentration on the quay facing a ship is possible.

Luffing jib quay cranes with horizontal motion, either of the hook or of the jib head, represented great progress. These cranes, of which by far the greatest number are the main equipment of all the largest ports, are preferred also because they allow of concentration in a given area of quay, thus permitting the required loading and discharging output of a complete ship.

It has been ascertained that the speed of all motions represents a maximum which may not be safely increased, and therefore no higher outputs by cranes can be obtained by increasing actual speeds which are indeed already high.

The duties of quay cranes may not be separated from the needs of the traffic on the quay. In modern ports quays are wide because they are provided with two and even three rail tracks and with a platform in front of the sheds.

Railway traffic should be undisturbed as much as possible; therefore, the revolving structure of the crane was from the first mounted on high traversing gantry instead of low truck. Gantries allow of an almost undisturbed traffic under the cranes.

In Italian ports, even more than gantries, semi-portals travelling on one rail near to the edge of quay and one high rail lying longitudinally on the front of the shed are customary. In such manner, the wharf area with its railway installations is completely cleared, and so incoming and outgoings traffic is made easier.

Semi-portals as now built have considerable width in plan. They allow of a small clearance for discharging on to second and third track, so that the wharf area is almost completely covered up in plan by them. In order to prevent this inconvenience, a semi-portal supported at three points, instead of four, was recently devised. More precisely, the two wheels at the land side are replaced by one wheel fitted to a very narrow girder, which branches off from the wide structure of the crane platform. In such a manner, the covering up of wharf area is reduced to a minimum when semi-portals are brought close together. This is a great advantage in discharging the goods on to wagons. In this semi-portal type, only the lower wheels at the water side are operated for the traversing motion.

In spite of the improvement, however, it was observed that their concentration was still impossible (to allow two or three cranes to work simultaneously on a single hold) even where the ship was of big tonnage.

The latest progress in quay cranes led to the elimination of the circular rail and nowadays, the revolving structure is supported by a pillar of reduced diameter, solid with the structure of the girder of the semi-portal, on a ball thrust-bearing, and horizontal rollers travelling on a rail welded to the said pillar. In such a manner the size of the cabin can be noticeably reduced and therefore that of the lower structure of the portal. Moreover, the pillar crane

Modern Quay Installations in Ports—continued

type allows access to the cabin through the hollow pillar easily and safely even when the crane is at work.

Still more recently, revolving equipment consisting of the pillar, the ball-bearings and the horizontal rollers, was replaced by a large ball-bearing with two ranges of balls and two rings, one of which is fixed to the semi-portal and the other supports the whole weight of the revolving structure of the crane.

Fig. 1 shows the advantages offered by the latest types of quay cranes.

We have already said, referring to crane standardisation, that the loading and discharging output of quay cranes may not be increased by further increasing the speeds of the several motions of the operating cycle: lifting, luffing and slewing. Therefore higher

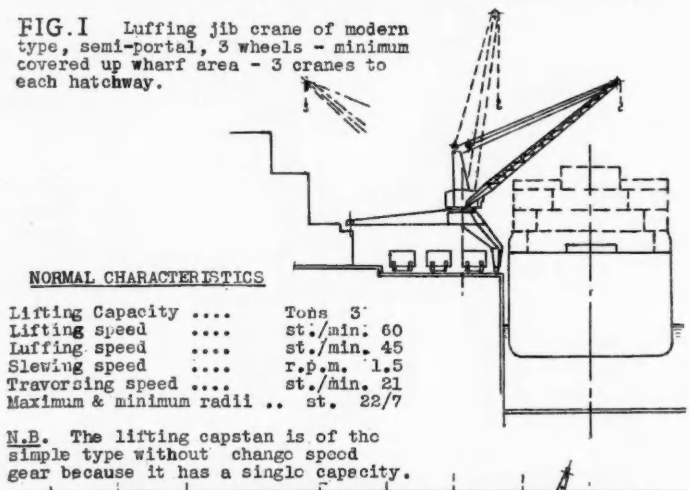


FIG. I Luffing jib crane of modern type, semi-portal, 3 wheels - minimum covered up wharf area - 3 cranes to each hatchway.

output obviously could be only obtained by eliminating at least one of these motions.

The problem has been attacked and a new special type of crane was developed, called a swinging jib crane, which eliminates the slewing motion. This crane (Fig. 2) is mounted both on gantry or semi-portal, and mainly consists of a crooked jib revolving about a horizontal axis above the cabin. The jib is provided at the rear end with a spur sector operated by a luffing capstan.

Owing to the crooked shape of the jib, the load is brought, by the luffing motion, from the ship on to wagons or wharf without any slewing being necessary. The slewing motion still may be possible but it is only used for positioning. So long as the position of the crane has not to be changed, the slewing motion is not used, and as already said, in any case it is not a necessary motion in the operating cycle.

Obviously, with equal characteristics, this type of crane has a higher capacity, due to shorter total operating cycle. Moreover, this type allows of a great crowding of cranes facing a ship, because owing to lack of slewing motion, any collision between adjacent cranes by the rear ends of their cabins is excluded.

Cranes for Bulk Cargoes.

All the above considerations are valid for cranes with hook, used for handling general cargo. When cargoes in bulk like coal and ore are handled, the crane must be provided with a grab instead of a hook. In this case the capstan obviously must be suitable for lifting and operating the grab. The most modern type of these capstans has four ropes and two motors, one for hoisting of the loaded grab and the other operates the opening and closing of the grab.

For discharging cargoes in bulk from the ship on to wagons, standard type luffing jib slewing cranes on travelling gantry are preferred, which have six tons gross lifting capacity, gantry height 10 metres above rail level, and variable radii from 22 to 8 metres. The lifting speed and the operating speed of the grab is normally assumed sufficiently high, i.e. about 60 metres per minute. The other motion speeds are practically those standardised of the cranes with hook.

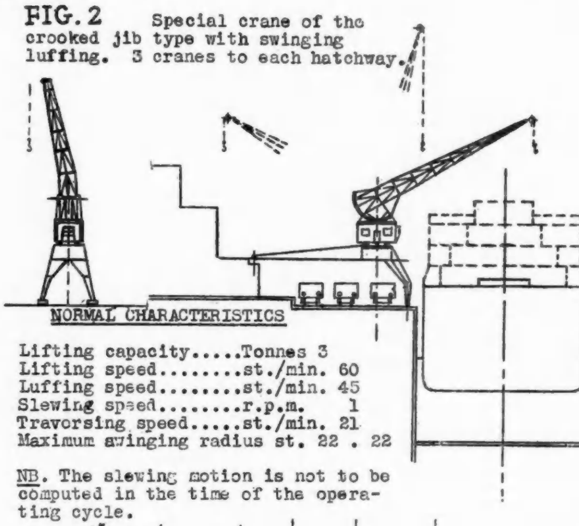


FIG. 2 Special crane of the crooked jib type with swinging luffing. 3 cranes to each hatchway.

When dealing with cargoes in bulk from the ship on to stock pile or vice-versa, unloading bridges are used, which are nothing else than cranes travelling on gantries with a large span. In these unloading bridges the span changes accordingly with the width of the store yards. This width is generally between 40 and 70 metres. The clearance under the bridge reaches the limit of 12 metres.

The unloading bridges are constructed either with slewing jib crane travelling on the upper-flanges of the bridge or trolley travelling in the interior of the supporting girders of the bridge. In this case, in order to allow of the grab having access in the hold, the bridge has an apron projecting over the water, hingeing clear for allowing the ships to be tied up.

The upper travelling cranes have noticeably high speed, between 120 and 180 metres per minute; the trolleys travelling internally have still higher speeds, reaching and sometimes exceeding 250 metres, according to the span of the bridge.

In most modern special unloaders of American type, the working gear with the operator is located directly above the grab and is moved with it. In such a manner the operator can closely watch the work of grabbing. Thus there is full exploitation of the facilities and excellent outputs are obtained.

The Stevedore's Point of View

By G. SIRTAINE

In my opinion, there are three ingredients of the Ideal Port—man, technique and cargo. I propose to examine these in detail, and in so doing, I shall base my observations—as a good citizen of Antwerp—on what I have seen at home.

The Human Element.

Those who study port problems too often only see the material aspects of the question; but in all work, the human element plays, at some stage, a preponderant part. This is also true in the world of transport.

In a sea port, man has an important role; but even those who admit this premise often make a further error, that of considering **only** the labour force. I freely admit that this is important—and I shall return to this point later, but I should like here to consider the employers.

The Port employer should be, first of all, a cultured man—this, alas, is very rare. His culture will be of immense value in understanding those who come from the four corners of the world. How can a shipping agent, an expert or a stevedore, for example, expect to satisfy an American shipowner when, owing to lack of culture, he is more or less ignorant of the language, the views or the mentality of his customer?

Next, the port employer should have, in addition to a good general grounding, some specialised knowledge — and it is not enough to have specialised in his own particular subject and no other. A stevedore must thoroughly understand the characteristics of the various forms of merchandise, their value and their resistance to destruction by certain physical or chemical agents. He should also be a good psychologist so that he can handle both workers and shipowners; he should have a knowledge of national and international legislation concerning the responsibilities of the transporter etc.

Finally, the port employer should be irreproachably honest, for in his hands rest the fortunes and the fate of ships and of cargoes, and countless precious lives depend on his care, his honesty and his love of work well done.

When examining the requirements of the Ideal Port on the human level, one should also think of the administrator, for he plays a very important part, from the Director General right down to the last surveyor. It is of no use having excellent employers and workers in a port if, at every turn their initiative is hampered by negligent or too-zealous officials. It is precisely to avoid the evil of officialdom that some envisaged the creation of ports managed by business men on the lines of private industry. Should such a method be prefered to that which is considered classic in western Europe, where the town or state run large ports through the medium of officials?

It is difficult to answer that question; but the more one studies it, the more one concludes that it is less a question of the kind of management than of the men concerned. Management by the authorities encourages slowness and slackness when those appointed or, worse still, those elected by the people, are lazy, which is too often the case. But management on industrial lines, which takes too much account of dividends is often expensive to the user.

Only time and place can determine the best solution in each individual case. But the user, be he trader or shipowner, should never forget that although management by the authorities may entail administrative slowness, it also nearly always offers "service"—imperfect perhaps—but cheap.

Our analysis of the Ideal Port from the human point of view now brings us to an element which is, in certain respects, the most important: the **docker.**

One of the few questions on which there is not unanimity in I.C.H.C.A. is that of inviting Trade Unions to help in our work. I, personally, oppose such an invitation and I know that my Belgian friends agree with me. This attitude is not due to scorn or lack of interest in the worker. Rather, we think the aims of our Association cannot be usefully served by collaboration with Trade Unions. This does not mean that we shall, whatever happens, ignore the possibility of co-operation with the Unions. In Antwerp itself such co-operation exists and is becoming increasingly closer; but such co-operation can only be fruitful in conditions suitable to each country and each port. A day may come when such co-operation can usefully become international, but we have not reached that point yet—the degree of emancipation of the docker still varies too much between port and port.

It is precisely this question of emancipation which is important in the study of social problems in a sea port, and it is considered too subjectively and not objectively enough.

"Subjective emancipation," if I may be permitted to coin a phrase, is represented by minimum wages, hours of work and social benefits such as pension, sickness and accident insurance, family allowances etc. But even in this sphere there are too great variations between ports, and especially between neighbouring ports. These differences are at the root of unhealthy competition, because the burden of such competition in the long run falls on the docker. There is an immense amount of work to be done in this sphere in the way of contacts between employers and between unions.

The "objective emancipation" of the docker is represented by his degree of independence, and liberty to lead his own life; this includes a real right to strike which should not exist only on paper, the right of free association, the right to a just share in the goods of this world.

I know I touch on a complex and delicate problem but we have no right hypocritically to ignore such problems, for the policy of the ostrich would only lead us straight into the catastrophe of revolution.

Transposing these more or less theoretic ideas to the practical plane, it is quite obvious that it is not enough merely to pay the docker more or less reasonable wages and give him a few social advantages; he must also be given the opportunity of becoming someone in society. By co-operating in these two kinds of emancipation, employers will not be helping to dig their own graves, as so many imagine; on the contrary, they will be creating an atmosphere favourable to the functioning of the ideal port. For the output of the worker, both in quantity and in quality, depends on his degree of emancipation which, in turn, creates the joy of working.

Naturally in all this we must not lose sight of the training of the docker. We believe that such training—except in the case of some specialists—can only be acquired by practice. The best way is to get the son to team up with the father, and the younger brother with the elder. It is in this way that crack gangs are formed.

I have still to examine how much what is called "welfare"—canteens, sports grounds, showers etc.—help to make a good docker. Everything probably depends on the degree of the docker's education, which will determine what use he makes of these facilities. But here we tend to tread on ground belonging to the authorities and the unions. The employer should be careful to give his workers material advantages which will be the reward for good work. Let others undertake the task of educating the worker so that he makes the fullest use of the advantages he has acquired. A great and noble task faces both the leaders of a country and the leaders of the unions in this respect.

The Technical Element.

If it is largely the value of the man which determines the success of a port, it is nevertheless true that this value can be enhanced by adequate technical aid. In this manner I shall confine myself to one problem, that of handling gear on the quayside, and propose to examine two radically opposed tendencies: that ruling in America where the crane park has been reduced, and that ruling in European ports where the number of shore cranes is very high. Which of these two is the better?

A German specialist, Ing. Neumann, can greatly help us in this matter, by virtue of the many studies he has published.*

In this connection, one preliminary question arises: are circumstances such as to permit a free choice between these two systems? If the answer is in the negative, then the problem disappears. What are the circumstances to be considered? There are two primary:

* A brief extract of a paper by Dr. Ing Neumann follows. Readers of the "Dock and Harbour Authority" will remember that the issues for June and July 1952 contained an article entitled "Handling of Cargo at European and U.S.A. Ports" by the same author. In this the pros and cons of two distinctive methods were discussed.

The Stevedore's Point of View—continued

(1) Are the sites to be equipped free from the influence of strong tides?
It is obvious that at quays where tides vary several metres it is not possible to use derricks for they would be useless at low tide and the quay would have to be equipped with an adequate number of cranes.
It should be noted in passing, however, that for ships of heavy tonnage the tidal variation would have to be quite considerable to eliminate finally the use of the derrick.

(2) Have goods to be handled simultaneously from quayside and lighter?
In places where the flow of goods is such that one part of the goods must arrive directly on the quay and the other part loaded directly on to the lighter, the American system cannot operate, for the derrick can only work on one side at a time, over the quay or the water. Where simultaneously working from quay and lighter is needed, cranes have to be used on the quayside and the derricks for working the lighters.

It is obvious that the above remarks must not be too strictly interpreted, and sporadic working of lighters would not, ipso facto, render the American method unusable.

Let us assume that local conditions are such that a free choice can be made between equipping a quay with shore cranes or constructing a narrow pier of American type equipped with small mobile gear; what are the respective advantages of the two systems?

Here we should draw a distinction between the position of the user-shipowner and that of the port operator.

As regards the user, experience has shown that loading and discharging operations are more rapid in European ports than in American. We must admit that the handling output is 50 per cent. to 70 per cent. higher when the quay is equipped with modern cranes. If one considers the port in the light of "service rendered," this advantage should close the debate and it seems to me that the case, as far as the user is concerned, is complete. What however is the position of the operator? Here opinions differ; but without entering into too great detail, it seems evident that a quay equipped with cranes and adequate gear would cost very much more than the construction of an American type pier, even taking into consideration the cost of fork-lifts, trucks, small cranes, pallets etc. However, despatch being slower on a quay not equipped with cranes, a greater length would be necessary to cope with the same volume of traffic. Such extensions can be very expensive and in certain cases would be impossible owing to lack of space.

The Cargo Element.

A few words now on the last element. It is certain that there must be "cargo" in the Ideal Port, both in quality and in quantity. As to quality, I think that there should be a great variety of products for different destinations so that ships may have remunerative cargoes. The volume of loading and discharge should also be about equal. A port should serve a highly industrialised hinterland, for experience shows that dependence on transit traffic only means a fluctuating traffic which is at the mercy of political or economic forces. Local commerce and industry is very useful and gives a guarantee of a sufficiency and variety of cargoes.

In discussing the subject of cargoes, I should like to warn all those interested against the tendency to palletise everything, or use containers indiscriminately. This is an easy solution, but may entail heavy penalties. A film was shown at the last I.C.H.C.A. meeting in Paris on the palletisation of sugar, which I found most interesting; but I heard some remarks from shipowners about wasting space on board which would certainly not have pleased the "palletisers"! As for containers, you should have seen one instance of the discharge of these, all carried out according to rule, when one side suddenly broke out and a rain of 2 tons of toffees ensued; prudence is therefore paramount.

Conclusion.

To end my paper, somewhat incomplete on account of the vastness of the subject, I could say that the ideal port is one that offers all the services one could desire. An ideal cannot be achieved, and the service offered by a port will always be hampered by some contingency. But though an ideal is not attainable, one can nevertheless strive after it. This can be done by training both directors and executives, by drawing up modern techniques. On these two counts, our Association has already done quite a lot, and we hope that the contacts between men and ideas which it fosters will bear fruit in the future. That is my most earnest and sincere desire.

New Cargo Cranes in the Port of Hamburg

By Baudirektor Dr.-Ing. HANS NEUMANN
(Hamburg)

This paper dealt with two main points:—

(1) the question whether ports should be equipped with dockside cranes or should follow the U.S.A. method of handling cargo with ships' gear only—and the opinion expressed was strongly in favour of cranes, and

(2) whether, in the case of wharves equipped with sheds, preference should be given to the full portal or the semi-portal type of crane—and here Dr. Neumann pointed out that whereas at Bremen the semi-portal type had been used for many years, Hamburg, in reconstructing its port, had decided in favour of the full portal type. He added, however, that, because of the type of traffic handled through Hamburg (due partly to political considerations) the port organisation was compelled to extend the rail track system on the water side of the sheds, this modification entailing an alteration to the crane system. If semi-portal cranes as used earlier in Hamburg were again installed, they had to be of a span of over 25 m. It was therefore decided that full portal cranes should be installed throughout.

The experience gained justifies this decision. At some points of the quay the railway service track crosses the crane rails. To permit the cranes to run safely over the crossings, the landside track wheels of the portals have no flanges while the waterside wheels are of the double-flange type for proper guidance of the cranes. This arrangement has proved to be very satisfactory in actual practice.

The number of cranes to be placed on the wharf thus is influenced by the type of portal, since a smaller number of permanent cranes is needed on the berth if it is possible to increase their number quickly by relocating cranes working on less busy portions of the wharf. The mobility of modern cranes facilitates such an interchange of cranes on a long wharf stretch from one shed to another. These considerations led to a change of the density of cranes. Whereas in earlier times it was the practice at Hamburg to provide about one crane per 20 m. length of shed, this is now about 25—28 m. for modern wharf sheds, and efforts are being made to increase this figure to 30 m. although the port management is keenly opposed to this development.

To conclude his talk, Dr. Neumann dealt with the constructional details of the new cranes selected for manufacture and referred to three or four particular types, making the final point that the installing of more cranes (at lower prices) will provide facilities necessary in the joint struggle of the ocean ports against delay in the turn-round of ships.

Oslo Dock to be Lengthened.

Akers mek, Verksted, Oslo, has received permission from the local City Council to lengthen its floating dock to enable larger vessels such as whale-oil refineries to be docked. It is proposed to add a section 84-ft. 9-in. in length and to move the dock 10-ft. nearer the shore in order to reduce the distance it would project into the harbour. In 1935 permission was given for the dock to be moored in its present position for a period of 20 years.

U.S. Port Organisation and its Effects on Cargo Handling

By Mr. FRANK W. HERRING
(Chief, Planning Division, The Port of New York Authority)

No U.S. port is controlled wholly by one authority and consequently visitors often ask, after the responsibilities of various port interests have been explained to them, "But who really controls the port?"

I have prepared this paper to answer that question, or possibly to show why that question cannot be answered, and because I believe such an explanation might make some of our cargo handling methods and problems more understandable to the outsider.

A brief description of the historical background of U.S. port development will bring out some of the basic reasons for the organizational structure and physical make-up of our ports.

Three long coast lines and a moderate average tidal range have combined with other favourable geographical factors to give the United States an abundance of easily-constructed ports (as compared to the tidal-basin construction of many European ports). As the population of the United States grew and economic activity expanded, the number of our ports also grew and their relative size and importance changed in response to immediate economic needs. The early settlers in the New England area, for example, sought outlets for their surplus products in the West Indies and needed finished goods from Europe and therefore needed ships and ports to serve them. Ports like Providence, New Haven, and New Bedford—names hardly known as ports to-day—were among the first and best United States ports.

With every coastal indentation being made into a port of one sort or another, there was no need for the Federal Government itself to build or finance port facilities. The port needs of the United States, a country economically self-sufficient to a large extent, were adequately served by the development taking place so naturally.

Just as an unplanned growth and development of ports occurred on a nation-wide basis, so within the ports the growth and development also followed a largely unplanned pattern.

The Port of New York, for instance, followed just such a pattern. The lower East River waterfront was the first section that was developed and once ranked as the most important segment of the harbour. Changing factors however soon transformed the East River into one of the least important sections of the port. The railroads acquired large segments of some of the best waterfront to serve their individual needs. Private dock companies bought up waterfront property to develop as business ventures and municipal authorities built up sections of waterfront belonging to the city.

It is apparent from my description that a centralised form of port organisation is not characteristic of United States ports. But this is not to say that all is chaos. On the contrary, the organisation that has developed, in what can be best described as an *ad hoc* manner, serves the needs of shipping as adequately as the ports having the centralised form of organisation. Indeed, the Port of New York, a prime example of an *ad hoc* development, is ranked as the greatest port in the world.

Having explained what U.S. port organisation is not, I will try to explain what the form of U.S. port organisation is.

I think this can best be done by dividing the port functions into two categories: (1) the ancillary functions, such as customs, channel maintenance, etc.; and (2) the prime functions, such as dockage, warehousing, etc.

(1) Ancillary Functions.

In all U.S. ports the ancillary functions are usually carried out by various agencies of the Federal Government. These agencies are organised and controlled by their parent departments in Washington. Thus the customs service is provided by the Treasury Department; quarantine by the Department of Health, Welfare and Education; immigration control by the Department of Justice; channel dredging, pollution supervision, and control of all dredging and other work in the harbour channels by the U.S. Army Corps of Engineers; and maintenance of buoyage systems and licensing of harbour pilots by the U.S. Coast Guard (a part of the Treasury Department). Generally speaking, all these ancillary services are provided quite independently of any local authority.

The "port control" existing in U.S. ports is exercised through these government-provided ancillary services; and whatever uniformity there is in our ports also comes about because of these Federal Government functions.

An absolute control of inward and outward movement of ships in U.S. ports is achieved through those ancillary functions dealing with ships, viz., customs, quarantine, and immigration. Every ship captain is required to "clear" his ship at a local customs office before every sailing and after each arrival. The "clearing" consists of seeing that all ship regulatory formalities, such as customs, bill of health, etc., are in order. If any legal formality has not been complied with, it is possible to detain the ship.

The ancillary functions dealing with the port, viz., channel maintenance, buoyage, etc., provide a control over the adequacy and uniformity of those port facilities essential to the normal functioning of a harbour. Under this organisational arrangement, all U.S. ports have identical buoyage systems; the harbour pollution regulations are uniformly enforced; the maintenance of harbour channels is systematic and regulated on a nation-wide basis; and the protection of navigational interests within established harbour lines is ensured.

While I am sure that I have not been able to satisfy the questioner if he is looking for some agency that controls the U.S. port, I think you can see that an effective control does exist.

(2) The Prime Functions.

The category of port functions which I have called the prime functions, viz., dockage, wharfage, warehousing, etc., is another matter when it comes to speaking of an organisational control—in this there is little or no uniformity.

In the Port of New York the City of New York owns approximately 44 per cent. of the piers, private interests own 40 per cent., and The Port of New York Authority, despite its name, is responsible for only 10 per cent. of New York Harbour's ship facilities. The situation in New York is further complicated by the fact that the harbour lies in both the State of New Jersey and the State of New York.

The diversity of New York's pier ownership is duplicated in the other ports of the United States. The following table illustrates this diversity in a representative group of our ports.

OWNERSHIP OF DEEP-DRAFT SHIP BERTHS.

Port	Private	Railroad	Municipal	State or Port Authority	Federal
Boston ...	77%	8%	5%	8%	27%
New York ...	30%	10%	44%	10%	6%
Philadelphia ...	48%	30%	15%	—	5%
Baltimore ...	54%	30%	12%	1%	3%
New Orleans ...	25%	10%	—	56%	9%
Houston ...	70%	4%	—	22%	4%
Los Angeles ...	24%	—	68%	—	8%
San Francisco ...	9%	3%	—	71%	17%

Despite, or possibly because of, the great diversity in ownership, a substantial majority of U.S. ports have established one sort of port authority or another, the extent of whose powers suggests a surprising agreement in general characteristics of administration. This growing tendency in the U.S. to form local port authorities is an attempt to bring some plan and cohesion to the development and operation of our ports.

In New York, for example, the States of New Jersey and New York formed a compact to develop the port as a single geographic and economic entity. This compact resulted in the setting up of The Port of New York Authority and a port district (a geographic area embracing specific portions of both states).

The Port of New York Authority is more than just a harbour authority, however, since it is also concerned with every other form of transportation. All the airports in the port district, all the bridges and tunnels connecting New York and New Jersey, a bus terminal, a railroad freight terminal, and two truck terminals make up the list of Port Authority operations outside the marine terminal field. Here is an attempt to co-ordinate the development of all forms of transportation and facilities for a more economic functioning of commerce in the New York-New Jersey region.

U.S. Port Organisation and its Effects on Cargo Handling—continued

The Port of New York Authority has been asked by various local municipalities to study proposals to take over publicly-owned piers, but thus far this has resulted in taking over only the 10 per cent. previously mentioned. Even though the Port Authority's role in pier operation is relatively small, its role in promoting the use of New York Harbour and its indirect influence in the modernisation and development of the port are powerful factors in the future of New York Harbour.

The table, which follows, illustrates the great amount of similarity that exists in the functions of the various forms of port authorities that have been set up in U.S. ports. The combination of the right of eminent domain and the function of planning development, common to almost all port authorities, lays the foundation, I believe, for future co-ordinated development and operation of U.S. ports.

PORT AUTHORITY

Functions	Boston	New York	Phila.	Balto.	New Orle'ns	Ho'ston	Los Ang'l's	San Fran.
Development Planning ...	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Traffic Promotion ...	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Float Own Securities ...	No	Yes	No	No	Yes	Yes	Yes	Yes
Own and Develop Independent Sites ...	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Exercise Right of Eminent Domain ...	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lease Wharf Facilities ...	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Operate Harbour Craft ...	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Operate Facilities for Air, Rail, or Highway Transportation	No	Yes	No	No	No	No	Yes	No

The ease with which our ports were built, the abundance of natural ports on all our coasts, and the plentitude of good waterfrontage within our ports, as I have pointed out, were some of the principal historical and geographical factors behind the organisational structure of our ports. This organisational structure, in turn, has had a profound effect on United States methods of cargo handling.

Characteristically, U.S. ports have been built and developed extensively rather than intensively. Piers were scattered from hither to yon and built, more often than not, to serve one industry or one steamship company. Exclusive occupancy and exclusive use of piers in convenient locations seemed to be the most important factors in our port growth. As a result, our piers had to be built on a more economical basis than those in Europe, for instance, where a high utilisation is possible.

Finger piers, rather than marginal wharves, were built to consume as little of the relatively high-value waterfrontage as possible; housefalls and burtoning were developed to do away with the need for expensive cranes; two-deck piers; narrow aprons; etc., were all a result of the motivating force to build as economical a facility as possible. There were so many dock facilities, no one facility could support a large capital investment in cargo handling equipment or design.

I could continue to show how American cargo handling practices grew out of the geographical and organisational structure of the U.S. ports, but suffice it to say that American practices are basically well suited to the American port. That is why I believe it would be unwise to attempt to superimpose European or different practices on the U.S. ports or to attempt to compare the relative merits of one method against another. The crane, for example, is an economical machine at a wharf with a high utilisation factor, but certainly it cannot compare economically to the housefall at a pier that has a ship alongside only 25 per cent. of the time.

My main purpose in showing the casual relationship between our cargo handling methods and equipment and the basic economic structure of our ports is to illustrate that no one piece of cargo handling equipment or no one system of port works can be judged to be superior or inferior just in itself. Only when the particular economic and other local problems of a port are considered can the type of equipment or system of operation be judged to be suitable or not. I am not sure that these considerations are always made when a port is being equipped, so that it is entirely possible for a port to be equipped with expensive cranes when, in actuality, it would be more suited for a housefall or ship's gear handling arrangement.

I have indicated that there is a discernible tendency in United States ports to bring the physical facilities of the port under some sort of single port authority. In the first instance, this tendency usually manifests itself in port promotion activity, such as cargo solicitation, advertising, etc. The second step, and this, I believe, is still largely to come, is to bring the supervision of the bulk of each port's facilities under one agency. These centralising tendencies will, I am sure, bring about changes in our cargo handling methods. I should like to emphasise, however, that it will be the gradual change of port structure that will bring about a change in cargo handling methods and not the reverse.

This paper has not been meant to be an exhaustive treatise on U.S. port organisation and all its implications on cargo handling; I merely wanted to give one man's quick view of the U.S. port picture and to suggest some of the reasons for handling cargo the way we do.

The value of I.C.H.C.A. to U.S. ports, as I see it, is the fund of experience and knowledge it offers to those of us in the United States who are associated with and responsible for the growth and development of our ports.

The Discharge of Bananas in the Port of London

By F. H. BROWN

London has been an important port during the past 25 years for the arrival of bananas. In the early days, portable elevators were used for discharge and despatch and were found to be efficient and reliable. The great disadvantage, however, was the fact that they had to be lifted on to the ships' deck, which necessitated the provision of cranes or ships' derricks of at least 5 ton lifting capacity.

In 1938 a berth at No. 35 Shed, Royal Albert Dock, was completely re-equipped for the mechanical discharge of bananas. This equipment was much more ambitious than the portable type and was designed to give what was claimed to be the most modern and best equipped banana berth in the world.

During the war years the equipment was not in use but was carefully stored and preserved. In 1952 it was completely overhauled; a new straw shed was erected and a new weighbridge for the weighing of road vehicles was installed. A road vehicle park was also constructed and in September, 1952, the berth resumed its function as a banana discharge berth.

Experience soon showed that this equipment was much superior to the portable type and a great improvement in the discharge of bananas was very soon apparent.

The Type of Fruit.

The important point to bear in mind when considering this equipment is that all the bananas handled are unwrapped.

Two main varieties are shipped from Jamaica, Gros Michel and Lacatan, and no packing whatsoever is used during transit.

When the fruit is loaded in Jamaica it is stowed in the ship in bins formed by detachable boards. Stowage is effected by placing one tier of uprights and then horizontal riders are laid on top of the uprights. The stems are packed tightly to prevent movement during the voyage but, as the fruit is segregated into small bins, the bin boards prevent any heavy pressure on the fruit which might be created during the ship's movements in rough weather. The average bin contains about 600 stems.

The two varieties are loaded separately, stowed separately and carried at different temperatures.

Because of the special construction of the ships, the entire cargo can be under constant inspection during the voyage.

The Discharge of Bananas in the Port of London—continued

Shipping.

Fast, refrigerated ships are employed and the average time from Jamaica to London varies from 10 to 12 days, depending on the ship. An average full cargo is around 150,000 stems. Types of refrigeration vary but the principle is the same in that air at the required temperature is circulated through the fruit throughout the voyage.

Space for the elevators is left down each hatch at the bottom door.

The Discharge Equipment.

This consists of four electrically-driven movable gantrys which contain the elevator gear. These are entirely covered in with corrugated iron, so the fruit is protected against the weather.

The electrically driven elevators (pocket gear) take the fruit from the ship's hold high above the quay and lower down through spaces in the roof which covers the entire berth, the fruit then coming on to movable belts. Two belts are on each side of a double railway track so that all four hatches can work simultaneously to load two lines of railway trucks. The two quay belts on each side of the loading tracks are placed end to end so that by reversing the direction of travel of one quay belt the entire length of the berth can be used for loading from any one hatch when the other hatch which serves that particular side has finished working.

On the opposite side of the quay belts to the railway tracks, road vehicles can back up to the belt and load direct from them.

At the end of each day's working, the elevator is drawn up into the overhead gantry and the ship's hatches can then be replaced and air circulated again through the cargo until working commences the following morning.

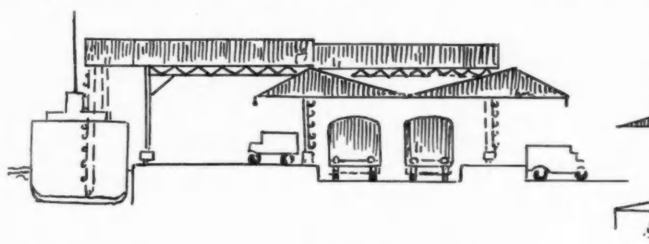
The Working of a Ship.

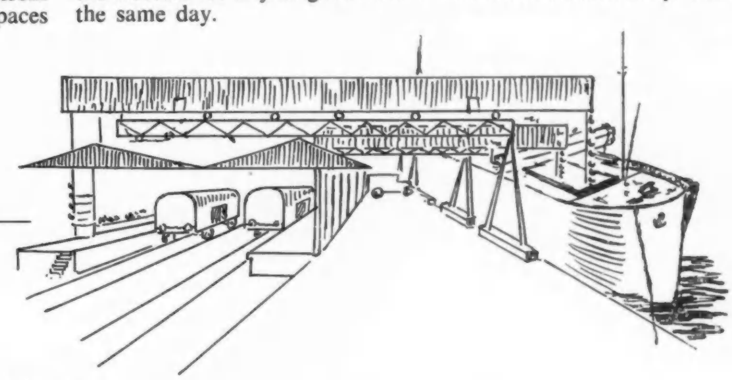
Immediately the ship has been berthed, hatch covers are removed and a heavy iron sinker is lowered to the bottom deck in the elevator space which has been left during loading. The overhead gantry then moves out on rollers over the hatch and the pocket gear is lowered in the hatch and connected to the sinker.

Whilst this gearing is taking place, the rail trucks which have been tared and, in cold weather, steam heated, are placed in position and road vehicles which have also been tared are placed on the opposite sides of the quay belts.

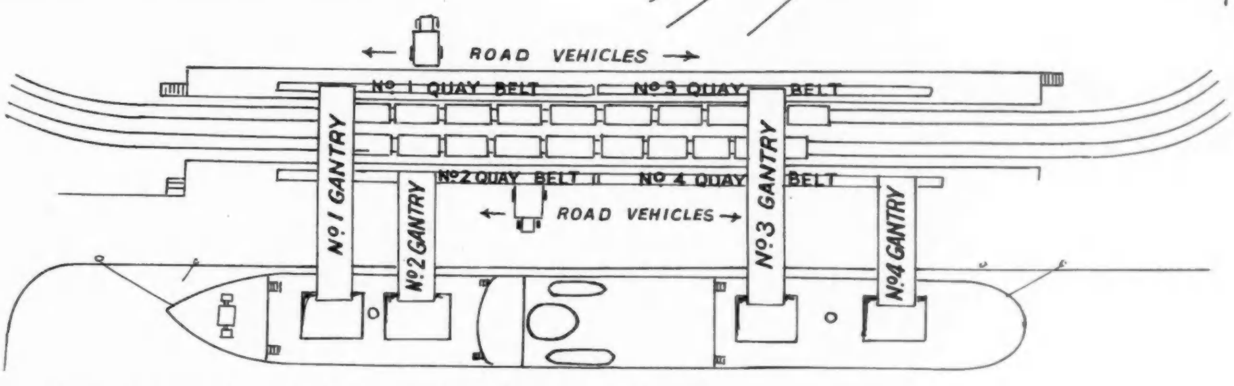
All decks are worked simultaneously and the men in the ship's holds place one stem in each pocket, keeping all the pockets filled. As the pockets travel through the overhead gantry, a mechanical device registers a count of the stems. Stems are then carried down to the quay belts and as they travel along are picked up by two other men who hand them to loaders who stow the fruit in the trucks and road vehicles which have previously been lined with straw. A final covering of straw is placed over the fruit. The fruit is tallied into vehicles and trucks by tally-clerks provided by the Port Authority. When the shunt of railway trucks is completed it is drawn out by a steam engine and a fresh shunt of trucks moves up into position. Whilst this movement of railway trucks is taking place the road vehicles continue to load, thus avoiding any stoppage in the discharge operation.

Before stopping work for meal breaks, etc., all pockets are emptied so that at no time is the fruit exposed to the vagaries of the weather for any length of time. All fruit loaded is despatched the same day.





Banana Berth, Royal Albert Dock, Port of London.



Output.

Whilst careful handling of this perishable fruit is not sacrificed for speed in discharge, a very high output is maintained. The pockets can travel at a high speed and mechanical or electrical breakdowns have been very rare. In a working day from 8 a.m. to 7 p.m. as many as 87,000 stems have been discharged, loaded and despatched to destinations. Five railway trucks and seven road vehicles can be loaded simultaneously at each quay belt.

Labour is provided by the Port Authority and is under the direct supervision of a Port Traffic Officer. An important factor in this work is that most of this labour has had many years experience in handling unwrapped bananas.

Types of Vehicles.

Road vehicles are insulated box lorries which are loaded and sealed with a Company Seal on completion of loading.

Railway trucks are specially constructed, being insulated and also fitted with steam heating apparatus by which in cold weather they can be pre-heated and also steam heated en route.

Latest Developments.

To improve still more the flexibility of the plant, an extensive modification has recently been carried out to the main structure which allows greater lateral movement of one of the gantrys along the quay so that the equipment is able to be geared to fit almost any type of banana carrier likely to use the berth.

"The Wingloader" in Reducing Cargo Handling Delays

By Cdr. OLIVER D. COLVIN, M.Sc.
and
JOSEPH A. FETCHKO, B.S.

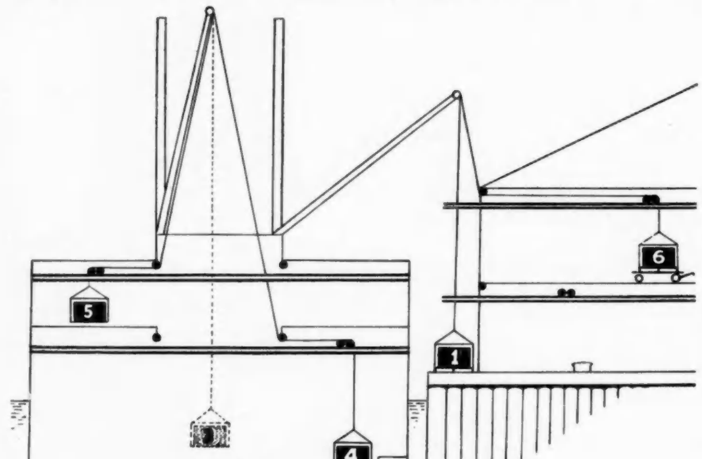
While modern ships and piers are fitted with excellent speedy winches or cranes, there remain very serious delays in handling cargo on the ship. Actual time studies of loading and discharging cycles show that *total* earnings to be saved by reducing delay are much larger than most experienced operators are aware of.

A particular study incorporating data usual to the Port of New York indicates that:—

(a) Delay time with idle gear amounts to two-thirds of total operating time and two-thirds of this delay time is lost in the hold;
(b) an average (U.S.) dry cargo ship spends 60 per cent. of her life in port and 40 per cent. at sea.

A list of the familiar causes of delay would include:—

(a) poor "spotting" ability for loads,
(b) hooking on,
(c) dragging loads,
(d) slow stowage and breakdown,
(e) clumsy cargo such as rails and pipe,
(f) rigging special gear to handle clumsy cargo,
(g) swinging loads part way into wings,
(h) danger to longshoremen from swinging loads or working in square of hatch,
(i) breakage requiring coopering and inviting pilferage,
(j) fatigue of longshoremen from long hand carriage,
(k) handling heavy bags or packages requiring two or more men,
(l) multiple handling of individual pieces of cargo,
(m) laying dunnage to provide working levels,
(n) handling dunnage,
(o) preparation time for loading and rigging handling gear,
(p) load hanging dead waiting for previous load to clear,
(q) secondary delays such as stopping to top and reset booms,



"Underdek" Wing Loader - Fig. 1

loading lift trucks and other gear.

Similar delays are encountered on the pier in handling cargo to and from the hook.

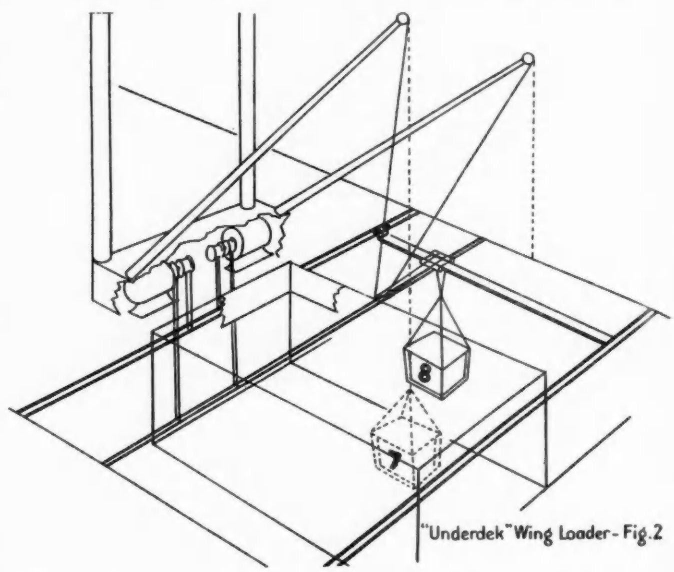
As winch and crane speeds are far ahead of the ability to stow and discharge loads in the wings, many progressive methods and designs have been devised to improve "spotting ability" underdeck. Among them are:

(a) Vang posts and topping list winches to handle boom-with-load within square of hatch;
(b) Guy and Topping Lift winches to handle boom-with-load within square of hatch;
(c) Moveable half decks are loaded in square of hatch and rolled into wings;
(d) Enlarged hatch openings;
(e) Twin hatches.
(f) Under deck bull line.

The Fetchko Underdeck "Wingloader"

The ideal device to reduce delay in wings should:

(a) Be attractive to labour because of less fatigue and greater safety, i.e. no men in square of hatch when working wings; less manual lifting or carrying;
(b) allow the gang to work more loads at the same time;
(c) need fewer men per gang;
(d) eliminate landing load in square and redistributing it;
(e) spot load at stowage point at any height from deck and provide selective working of parcels of cargo for separate ports;



"Underdek" Wing Loader - Fig. 2

(f) carry load in continuous "through the air" motion between decks and stowage zone;
(g) be adaptable to cargo of clumsy shapes and weights;
(h) eliminate landing platforms for 'tween decks;
(i) improve outturn of cargo by:
(i) less handling, (ii) more careful handling, (iii) reduced breakage, (iv) reduced pilferage because of less breakage;
(j) decrease "direct" delay of hook;
(k) decrease "secondary" delay from preparation of hatch and gear;
(i) add little additional weight;
(m) occupy minimum space while operating and less when secured;
(n) have simple one-man control;
(o) require no additional electric generator capacity.

Such a solution appears in Fig. 1, showing a section of a freighter alongside a double-decked pier with a narrow apron, so common in New York Harbour. Fig. 2 is a perspective view of an upper 'tween deck. Ordinarily, when a draught is picked up at position (1), it is landed at (2) and the hook goes back for another load. Often it hangs in position (3) until the load at (2) has been cleared. Or, for safety's sake, the draught is held at position (1) until the hatch-tender signals clearance. This in turn holds up handling on the pier which should be charged against the hold delay time. The load cannot be landed at the 'tween deck without topping the boom over a platform. If the draught could be carried to position (4) in the lower hold or position (5) in a 'tween deck during the idle hook time, it is clear that more loads could be handled in a workday. The part of the gang that ordinarily works at position (2) can work at another point *producing* final stowage, rather than serving as mere "safari bearers."

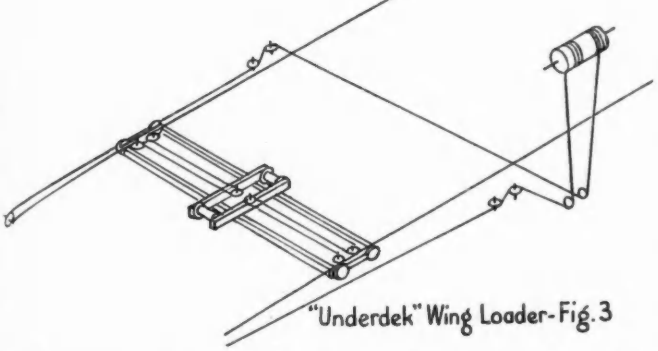
The Wingloader consists of a special treatment steel carriage of hatch length, which can be moved thwartship all the way to either ship's side or stopped at any intermediate point. It moves on rails in thwartship channels fitted forward and aft of the hatch. A small cross carriage is mounted on it to guide the draught into any fore-and-aft position (Fig. 2). There is no need to take time

"*The Wingloader*"—*continued*

to change the cargo boom which can usually operate from one central position.

The cross carriage bears two idling rollers, one for loading to port and the other to starboard. When the load is hanging as in position (3) (Fig. 1), the main carriage travels to the right pushing the rollers of the cross carriage against the runner. The rollers carry the line and, therefore, the load under fixed rollers on the lower hatch edge to position (4). The runner is slacked off by the winch driver on signal from the loader-operator stationed at the opposite end of the hatch. The draft is placed high or low, forward or aft in the wings on either side or on either deck as desired without being touched, landed, re-hooked or distributed by man-handling. The rollers are long enough to permit the hook or even slings and cargo nets to override, gaining clearance for high stowage.

A series of special rollers is fitted along the hatch's lower edges to prevent wear on the runner and the hatch. One-man remote control of the movements of the two carriage by the loader operator, who also signals the winch driver, ensures speedy operation. For a three-ton load the carriage can operate at 125f/m and for a one-ton load at 375 f/m or about 2 metres per second against a 10° list. The weight of a loader installation is five tons and the variable stroke Waterbury-gear winch combina-



"Underdek" Wing Loader- Fig. 3

tion about two tons, a total of 12 tons for two loaders at two deck levels. No extra electrical generator capacity is required as when Wingloader is working as the deck winches are paying out. When the winches are discharging, the horizontal pull of the runner in the wings brings the carriage to the square of the hatch.

No bulky underdeck racks, pinions or motors are required as the carriages are moved by an unique system of lines running to special winches on deck (Fig. 3). Two double-drum winches powered by variable-stroke Waterbury or Vickers pumps can operate one whole hatch whether fitted with one, two or three Wingloaders, as only one at a time can service a single ship. It is a matter of a moment to shift power from one loader to another. A special feature is the absence of electrical power underdeck with its danger of fire and accident. Constant-speed electric motors provide pump pressure which is utilised at the variable and reversible hydraulic motor ends by fingertip operation.

This Wingloader (World Patents applied for) opens the way to realise the benefits of speedy turn-round. No devices can deliver more than the human element permits. Labour should not be too reluctant to accept the Wingloader as working conditions are far improved as to safety and fatigue.

New Cargo Pier for Larne.

The new pier at present under construction at Larne Harbour will cost £250,000, one third of this total being contributed by the Northern Ireland Government. The increasing Larne-Stranraer ferry traffic in vehicles, trailers and the shipment of goods in large containers, has made necessary the construction of a special ramp to facilitate loading and unloading. The work is making good progress, and it is expected that the new pier will be completed in the early autumn of this year.

Maritime Transport by Containers

By A. VINCENTI

Before studying in detail the subject under discussion, it would be appropriate to ask "What is a Container?" Many definitions have been put forward, but I prefer that formulated by the Inland Transport Committee of O.E.E.C., namely:—

"A container is a method of transport (a framework, movable cylinder or other similar object) which is

(a) of a permanent nature, and thus sufficiently solid to be used more than once;

(b) specially designed to facilitate the transport of goods without any break necessitated by transference from one form of transport to another;

(c) furnished with accessories that facilitate handling, particularly during transference from one form of transport to another; and

(d) which is so designed as to be easily filled and emptied."

The word "Container" does not mean a vehicle or packaging material and is, in principle, only applied to a "carrier" whose interior volume is at least 1 cubic metre.

Since the end of the recent war the use of containers, which hitherto had been chiefly confined to land transport, extended to maritime transport, and I propose here to study their use in this latter connection.

It is not possible to give here a complete picture of the use of containers in the whole field of maritime transport. I shall therefore confine myself to information about their use from and to ports in those countries where maritime container transport has particularly developed.

(a) The United Kingdom.

In the U.K. containers are, for the most part, the property of the railways and are chiefly used for inland transport; a certain number are, however, used for maritime transport, particularly on the routes to the Continent and Northern Ireland.

Two regular lines which normally handle container traffic run, one from Tilbury (London) to Hamburg twice or three times a week, with occasional calls at Dunkirk, Antwerp, Rotterdam and other Continental North Sea ports, and the other from Preston in Lancashire to Belfast and Larne in Northern Ireland four times a week. These services are carried out by five vessels of 4,291 gross tons (103 metres in length and 17 m. beam), which are converted ex-naval tank landing ships. The large hold of this type of craft is capable of holding 70 industrial vehicles and containers, or twice the number of private cars.

The cargo of each ship naturally varies a good deal; on the Preston/Northern Ireland run, the average number of containers carried each trip is 20 full and one or two empty. The ratio is a good one, and few empties are returned.

Loading and discharge are usually effected through the bow door, which is linked to the quay by a flying bridge. Operation is speedy and can be completed on one tide.

The containers carried by this line belong either to private concerns or transport organisations. Many are of a light alloy; their external measurements are 5.03 metres x 2.06 metres, tare 900 kgs. and effective capacity six to seven tons.

(b) Denmark.

For some years, Denmark has used containers in her coastal trade, which, by reason of her geographical position, is very considerable. One shipping company in Copenhagen, has in service two vessels specially designed for container transport. They also own 1,100 containers which are placed at the disposal of clients free of charge. They are of the following dimensions: 1 m. 20 x 1 m. 60 and 1 m. 90 deep (volume, about 3.5 cubic metres). Loading and discharge is carried out with great speed by the ships' gear, and this has enabled the Company to economise one ship out of three in this traffic.

(c) Belgium.

In Belgium, too, container transport has begun to develop rapidly; the greater part of the traffic between Antwerp and Matadi

Maritime Transport by Containers—continued

is carried in containers of 4 cubic metres volume and loaded weight of three tons (of certain goods).

A fast sea-air-rail service has just been organised for goods between Belgium and all places in the colonies served by Sabena.

(d) The Netherlands.

In the Netherlands, transport by containers exists between Amsterdam and Rotterdam and the ports of the U.S.A., particularly New York. It should be noted that several Dutch shipping companies have placed refrigerated containers at the disposal of their clients, to compensate for the inadequate cold storage space on board. These containers are loaded on deck, and are generally very large (17 to 19 cubic metres).

(e) Germany.

It is only recently that containers have been adopted in Germany for maritime transport. The supply service of the German railways has been investigating new types of containers which would satisfy shipowners' needs without decreasing the possibility of enjoying the advantages of the "carrier loading" system which is highly developed in that country.

The special characteristic of this new type is completely to separate the containers from the transport medium used on land. The container alone is loaded on board. The following sizes have been chosen:—

Length (metres)	Width (metres)	Height (metres)	Volume (cubic metres)
3.05	2.3	2.1	10.97
3.05	2	2.1	9.39
2.605	1.89	2.1	7.38
2.25	2.15	2.1	7.3
1.5	2.3	2.1	5.2

This new type (height a constant figure) is now used for traffic between Hamburg and Bremen and New York.

(f) France.

During the last few years, the use of containers for maritime transport has considerably increased in France; this includes specialised types for liquids and also those for assorted goods. Those used for liquids in the Antilles rum import trade are of three tons gross weight and have a volume of 2.4 cubic metres.

A large number of containers are also used between France and the U.S.A., and between France and North Africa. In the latter case, the containers are loaded with assorted merchandise such as electric bulbs, wireless sets, furniture, etc., and on their return, they are used for citrus fruits and early vegetables exported to Metropolitan France.

(g) U.S.A.

In the U.S.A., too, the use of containers for both coastal and international transport has increased; and here it is interesting to note the achievement in transporting goods in unit loads between Seattle and Alaska. These unit loads are made up by the simultaneous use of box pallets, closed metal containers and ordinary pallets.

Container Dimensions are:

Outside: Length 1975 cm., width 1311 cm., height 2076.
Effective volume: 4.390 cubic metres. Tare: 590 kgs.

They have four sling straps on the upper part and can also be handled by fork lifts. Nine hundred containers of this type are in use.

The shipping company concerned estimate that the duration of handling operations is decreased by 66 per cent., and that the number of claims for loss or damage is 60 per cent. lower.

The advantages of transport by container include:—

(1) Economy of packing.
(2) Better protection against theft and damage of all kinds.
(3) Speeding up of handling operations during loading and discharge (providing the stevedoring organisation is adequately equipped).
(4) Considerable simplification of stacking, classification and weighing on discharge.

There are, however, difficulties which face the development of container traffic and these include:—

(1) High cost of containers.
(2) Loss of space on board and transport of useless weight.
(3) Loss of output occasioned by containers returned empty.
(4) Difficulties in handling: It should be emphasised that, as containers weigh up to five tons, they can only be handled by mechanical means, and when transported by sea are handled three separate times, i.e. on loading they have to be (a) brought alongside the ship; (b) hoisted on board and lowered into the hold; and (c) stowed.

In the case of discharge, the operations are similar, but in reverse order. The difficulties which accompany such operations on heavy and bulky packages will be obvious to those familiar with port work.

(5) Difficulties of stacking containers.
(6) Customs regulations and inspection.

Conclusion.

I have shown the importance now achieved by the use of containers in maritime transport and have tried to demonstrate both the advantages and disadvantages of this form of transport. I shall conclude by setting out certain measures which could help the use of maritime containers. At the present time there is considerable diversity in the construction of containers, and this can only render their widespread use in maritime transport a difficult matter. It would be of the greatest help if an international agreement, fixing the characteristics of one or more types of containers to be used *for all types of transport*, could be arrived at. We know that the International Railway Union has undertaken action in this direction and it is to be hoped that they will succeed.

We have also seen the difficulties which face the handling of containers on board ship, and we should try to overcome these by appropriate means, if the use of containers for maritime transport is to develop.

Finally, the Transport Committee of E.C.E. has adopted resolutions which favour the use of containers. It would appear that we ought to insist, in our several countries, that the system of temporary free admission of containers becomes general, and also that the privilege of transport under Customs seal be extended to transport by sea.

If, thanks to the intervention of I.C.H.C.A., progress in the various points mentioned can be realised, we shall have helped to develop a technique of transport, which, together with other methods of transport, can contribute towards the achievement of the objectives of our Association: to make possible the better utilisation of the ship by decreasing the time spent in port.

Containers for International Transport of Goods.

With regard to the foregoing paper, readers will be interested to know that the Ministry of Transport (U.K.) recently announced that as from 1st January, 1955, covered containers may be accepted for transport to and about the Continent under Customs seal provided they comply with requirements approved by the Inland Transport Committee of the Economic Commission for Europe and are duly marked with an approved sign showing that they conform to these requirements.

Privately owned covered containers for conveyance by rail may be submitted for approval to British Railways who are prepared to examine them and, provided the requirements are satisfied, to authorise the use of the sign prescribed for the container.

If it is desired to use the scheme for privately owned covered containers moving to the Continent by road or by steamship services not associated with British Railways, arrangements can be made for their examination and approval by the Ministry of Transport and Civil Aviation.

Full information regarding the regulations and the arrangements for approval, marking and certification of privately owned containers may be obtained from the Director, International Inland Transport Branch, Ministry of Transport and Civil Aviation, Berkeley Square House, London, W.1.

Education in Cargo Operations

By COMMANDER CHARLES L. SAUERBIER, U.S.N.R.
(Chief, Cargo Section, Department of Nautical Science, United States Merchant Marine Academy).

In the February, 1954, issue of this Journal, a brief account was published of a paper on "Education and Training in Cargo Operations" presented by Commander Charles L. Sauerbier at the Cargo Handling Symposium held by I.C.H.C.A. in Rotterdam last January. This had reference to the vocational training of dockers. At the meeting in Naples Commander Sauerbier, who is the Chief of the Cargo Sections of the Department of Nautical Science of the United States Merchant Marine Academy, read a further paper entitled "Education in Cargo Operations." This gave the American viewpoint concerning the formal education of ships' officers in cargo handling.

Part I of the paper dealt with the "Attainment of Knowledge about Cargo Operations" and in it was suggested the following four basic systems.

1. Sailing before the mast and by his own efforts learn what he must to pass the licence examination.
2. Sailing as an apprentice under a Government and/or company sponsored programme.
3. Attending a Maritime Academy for two or up to four years with short cruises during the summer on a non-commercial ship.
4. Attending a Maritime Academy with a well controlled period of at least one year at sea on a commercially operated vessel.

Sailing Before the Mast.

The young man who begins his career by shipping out as an ordinary seaman must acquire his knowledge of cargo operations by observing the operations and reading books. "Let us say he spends four years at sea as an average figure. If he is on a ship with a three-month voyage, he will make 16 complete voyages. Therefore, he would have an opportunity to observe about 16 loadings and 16 dischargings. I say that he would have an opportunity to observe these operations, but I know he would not observe them. In 23 years' experience in the shipping industry I have yet to hear or see a man before the mast voluntarily staying aboard his ship to observe the cargo operations."

Weakness in this method of development is that there is a great possibility that what he does observe will not be the truly best and right way of doing things, and if he is forced to learn by observation only, he is going to learn many things that he should not.

Government and/or Company Sponsored Apprenticeships.

Under the best programmes of the type where a young man serves at sea and is required to pursue a specified course of instruction, a good deal of excellent instruction and general training can be obtained. The outstanding weakness in this type of programme is that the type of help obtained in performing the studies may vary from inspired assistance to absolutely no assistance.

Maritime Academy Attendance with School Ship Cruises.

This system overcomes the defect of the first two systems mentioned relative to the possible incompetence and/or disinterest on the part of the individuals giving instruction to the student. However, it introduces a very serious weakness in that cargo operations under commercial conditions cannot be demonstrated. An occasional field trip does not offer a solution to this problem.

A thorough cargo operations coverage is possible only after the student has had ample time to observe actual conditions. With this background he can evaluate better what is said within the classroom.

Maritime Academy Attendance Integrated with Active Sea Duty on Merchant Ships.

The systems of education and training already mentioned had at least one of two possible defects, namely:

(1) The instructors are either non-existent or are not qualified to carry the responsibility of teaching the student officer. Even in the case of exceptions, there is small chance that the time or place will present itself for effective instruction. "I do not believe that enough men active in the shipping industry appreciate the seriousness and importance of teaching responsibility. To me there is nothing more obvious that the fact that the ship's officer of to-morrow will be no better than the education and training he receives to-day."

(2) The opportunity and the incentive to take advantage of actual cargo operations on actively engaged ships is lacking.

When a collegiate level course in cargo operations is presented with a background of participation in merchant ship activities, the greatest possible amount of instruction is obtained in the time allowed. That is the system followed at the United States Merchant Marine Academy at King's Point, New York.

The entire course at this Academy runs for a period of four years. The school's primary mission is to produce officers for the merchant marine. Each class is divided roughly into half deck officers and half engineering officers. Upon graduation the student receives a licence as a Third Mate, a commission as Ensign, United States Naval Reserve, and a baccalaureate degree in Science.

The first year is known as the plebe year and is spent at the Academy. The second year is the "sea year" and understandably is extremely popular with all Cadet-Midshipmen. Each student spends one year attached to various types of vessels. Following the Sea Year, the Cadet-Midshipman returns to the Academy where he continues his studies within the confines of a classroom for two more years. During these last two years, several field trips are arranged and all Cadet-Midshipmen spend a two-week period in the Operations and Traffic Departments of a co-operating steamship Company.

An advanced course in Cargo Operations consisting of 100 class hours is given after the sea year. The syllabus includes the shipowners' organisation for cargo procurement, stowage, transport, and delivery. A step by step outline of the procedure is made in booking, receiving, loading, and delivering cargo. Cargo responsibility includes instruction in the responsibilities and immunities of the shipowner and the shippers, as defined by the acts related to the Bill of Lading provisions. The role of the ship's officer as an agent of the shipowner is emphasised. The principles of stowage include four basic objectives, viz.: protecting the ship, protecting the cargo, obtaining the maximum use of the available cubic space, and obtaining the rapid and systematic discharge of the ship. Stowage of the cargo includes consideration of physical problems, preparation of cargo space, the stowage of the more common types of containers, the stowage of deck loads, and the stowage of special cargoes such as lumber, grain, dangerous goods, and livestock. In all, some sixty commodities are studied and special instruction is given in ventilation and refrigeration.

In Part III of his paper, Commander Sauerbrier dealt with the situation to-day. "Progress in Cargo Operation," he said, "may be measured in terms of tons per man hour loaded or discharged, the costs of handling and costs of all damage claims. In some areas of the shipping industry, great progress has been made, but there are some mighty dark and confused areas. The mere fact that there are many conflicting statements made by people in the industry about equipment and methods is proof to me that clarification is needed. As an example of this confusion let me point to the differences in opinion held by experienced shipping men on one factor. I would like to quote four statements made in answer to a question dealing with the relative efficiency of United States ports as compared with European ports. These are the replies made by four "experts."

Expert No. 1—"Foreign shipping is far superior to American shipping in efficiency. We are far behind European shipping in many ways."

Expert No. 2—"More primitive methods prevail in the United States. There is not enough mechanisation."

Expert No. 3—"United States ports have the best mechanised facilities in the world."

Expert No. 4—"I think the greatest fakes in the shipping industry are the methods used in European and other foreign ports."

He believed that there are three outstanding reasons for this lack of factual data and informed thinking that manifests itself

Education in Cargo Operations—continued

in so many vital sections of the shipping industry, and which has ultimately acted to deter progress. These were:—

1. An adequate and foresighted educational programme.
2. An industry supported research programme.
3. The importance of the subject of cargo operations.

The greatest progress had been made in the case of bulk cargoes or those that could be adapted to bulk carriage. Raw sugar, once carried in bags exclusively, is now carried in bulk with a tremendous increase in efficiency.

Undoubtedly, there are still trades where the bulk carriage of some commodities could be inaugurated with savings. Some commodities traditionally carried in unit containers could be transported cheaper in bulk with safety. Why could not coffee beans be carried in bulk with suitable separation between consignee marks and species? The savings realised by elimination of the longshoremen would be tremendous and ought to be worth the effort required to devise the method.

Improved methods for handling bauxite, fertilisers, ores, cement, and grains in bulk have made the carriage of such items easier and more economical. Wherever a commodity had been converted to bulk handling, great economies were realised.

The situation with respect to progress was not the same on the big modern general cargo liners. The actual number of tons per man hour on these ships, in some cases, was less to-day than it was a quarter of a century ago.

The cause for this drop in productivity during years of technological progress is almost entirely attributable to poor labour relations. If that were true, could training help better the situation? It would seem that a simple explanation of the economics involved would illustrate to labour and management how their actions tend to strangle the trade of the port on which they all depend for a livelihood.

Continuing, Commander Sauerbier said the ability to navigate and a sense of seamanship have long been the primary basis indirectly used to judge the competence of a ship's officer. Until a few years ago, he felt that this was a good basis for judgment also. From the standpoint of pure safety, navigation and seamanship were still of major importance. However, from the standpoint of economical ship operation in times of increasing competition, the officer's knowledge of Cargo Operations was of greater importance.

Pointing out some fundamental differences between these three areas of knowledge it was his opinion that navigation could be taught well within the classroom. It was based upon elementary mathematical concepts and the knowledge could be imparted to the student through drills and lectures to such an extent that the student could become an expert.

Seamanship in the sense that it is used on the average merchant ship could be partially also taught in the classroom, but many of the skills had to be finally developed on a ship under actual conditions at sea.

Cargo Operational knowledge was based on a number of concepts that could be taught in a classroom as in navigation, but this has not been done in many schools in the past. This was manifest in the lack of specific courses in Cargo Operations. The classroom knowledge could be enriched with experience as in the case of seamanship, but the difference was that an officer would never complete his education in cargo whereas he could conceivably approach this end in seamanship.

The courses in maritime schools and the examinations for licences of merchant officers did not reflect the importance of the knowledge of Cargo Operations to the fully competent merchant officer.

"I am convinced," said Commander Sauerbier "that the membership of the International Cargo Handling Co-ordination Association can greatly assist in increasing efficiency in Cargo Operations throughout the world by encouraging a proper emphasis on the importance of this phase of a ship's officer's background. Inasmuch as the primary purpose of I.C.H.C.A. is to increase the efficiency of a ship's turn around in port, I feel it proper to point out why I feel that better trained ship's officers can further this objective.

"As an example, let us speak of gear failures. Education in cargo operations implies a thorough background in the mechanics of the simple yard and stay rig. Failure of the cargo gear, in many cases, is directly traceable to a lack of knowledge on the part of ship's officers relative to the fundamental principles involved in analysing stresses on the parts of a fixed boom rig. There are an alarming number of ship's officers, including master mariners, who do not know the correct manner of ascertaining the best place at which to secure the working guy of a fixed boom. Still another seemingly trivial point, many do not know how to use the preventer guy correctly. I am aware that these examples are so basic that they appear unbelievable; yet I sincerely believe that what I say is the truth. If such elementary points are not understood, then what about other more obscure elements.

"What has this to do with ship's turn-around? I hardly feel it necessary to point out that gear failures slow down the discharging or loading rate at a given hatch. A jackknifed boom can demolish both winches at a particular hatch and injure or kill the winch drivers.

"The ship's officers are constantly living with the problems of loading and discharging a ship. What better source of information and/or opinions concerning cargo operational equipment and methods could there be than a well educated and trained ship's officer?

"The entire shipping industry is suffering to-day and has suffered in the past because of a lack of educated and well trained officers. Many present shipping people ask the question of why take the time and money to educate the ship's officer, when he only leaves the sea after getting a really good background. This is a basic problem of the industry of another type, worthy of its full attention, and, I believe capable of a happy solution in the long run. One suggestion to alleviate the above problem that I feel has merit is to make it a general policy to recruit all future shipping executives from the ranks of the seafarers. The ship must cease being considered only as a carrying unit and be considered as a community."

In conclusion, Commander Sauerbier suggested that the Central Executive Committee and the 24 National Committees of I.C.H.C.A. should commence immediately to take whatever action they deem feasible and effective toward throwing light into all the areas of darkness in the field of Cargo Operations.

It must not be assumed that this Journal in any way supports some of the statements made by Commander Sauerbier. On the contrary, this Journal agrees wholeheartedly with the criticism levied by the Special Correspondent of "The Journal of Commerce," who on June 12th wrote that, since Commander Sauerbier did not confine his strictures to the officers of any particular nationality, it had been presumed by the writer and by the various British marine superintendents and officers with whom he had discussed the matter, that Commander Sauerbier's observations were intended to apply to all and sundry—to British, Norwegian, Dutch, Danish, Swedish and German officers, for instance, as well as to American.

The concensus of opinion among British shore executives and ships' officers appears to be that Commander Sauerbier is unfamiliar with practices and certainly with standards obtaining in British merchant ships and is, therefore, unqualified to comment upon them. Further, that many, if not most, of his remarks were irrelevant and his strictures unmerited.

"If our officers generally were as inefficient as far as cargo work is concerned as Commander Sauerbier implied," a marine superintendent of a prominent line operating passenger and cargo liners observed, "there would be something radically wrong with our methods of training and selection, and with the examination standards set by the Ministry of Transport for officers' certificates of competency."

This seemed to be fair a comment, and typical of the views expressed by others. There may be, as Commander Sauerbier stated, "an alarming number of ships' officers, including master mariners," who do not know the correct manner "of ascertaining the best place at which to secure the working guy of a fixed boom," but they are certainly not sailing in British ships, or, indeed, in the ships of any of the many European nations with which the corres-

(concluded at foot of following page)

Economic Studies on Port Exploitation.

By HENRIQUE DAS NEVES CABRAL
(Department Chief Engineer, Lisbon Port Authority).

The study of traffic evolution in any port and its economic exploitation is becoming more and more necessary in order to face the competition of other ports. The lesson gained from others showing how port exploitation takes place, gives evidence of the struggle ports have to face to maintain their position.

For this reason, the European integration of ports is a problem worth specialised studies and hence, last January[1], the French Ports Association and the Union of Maritime Chambers of Commerce, examining jointly the Schumann Plan, urged the government to give attention to measures calling for the ports to be put in condition to withstand foreign competition.

As for Antwerp, the Maritime Federation's report referring to 1952, reveals some decrease in its commercial power, which certainly caused its Chairman, Mr. Ditman, to pronounce in favour of a pool of North European Ports[2], with the aim of enabling them to have a common hinterland for their users. A joint executive committee of Marseilles, Genoa and Savona[3] are similarly stressing the need to reduce their costs.

In the U.S.A. the need is increasingly shown for an economic defence of ports; that is why in the Commerce Department of New Orleans exists a "traffic analysis office," with the aim of checking continually the actual results against the target they have themselves set up; in Norfolk there is, with the same purpose, a Commercial Direction, and in New York the Traffic Department. These different departments search unremittingly for the best methods to improve and develop traffic, with the aim of facing a hard struggle against competitive ports, even against those of their own country.

Other examples, also show that we need to prepare the way for an economic defence of ports, laying the foundation of preliminary studies of the measures intended to be taken. The repercussion of these activities has already been felt in Portugal and in the port of Lisbon, the Department of Studies on Port Exploitation was created.

It will therefore be interesting to determine the most favourable way in which these studies may develop.

Plan of Studies

Its object may be summarised as follows:—

(1) To promote the methodical study of problems on port exploitation and to put into practice the conclusions derived from them.

(2) To keep in daily touch with the port exploitation results by collecting data, analysing the facts behind these figures and comparing them with the set targets as a guide to immediate action.

(3) To examine the possibility of mechanising the traffic operations, in order to determine the handling system or method best suited for the particular problems which present themselves.

(4) To lay down in an adequate way the plan of port operations—including the administrative and customs formalities.

(5) To settle the rules dealing with coastwise, ocean passenger and baggage traffic.

(6) To examine the tariffs assessed, and compare the cost of loading and discharging goods at different ports throughout the world, particularly those whose are or may become competitive.

(7) To study the most suitable methods for traffic exploitation, if entirely performed by the Port Authority, by private enterprises, or even by a joint system.

(8) To examine the possibility of putting into force more provisions in favour of the worker's safety and hygiene.

(9) To study regulations concerning dangerous goods with the aim of simplifying the legislation issued on this subject.

(10) To organise the man-power needed to maintain the essential activities of the port services, taking into consideration the results obtained by the systems already established in other countries.

(11) To study the arrangements for port training in other countries.

(12) The study the measures to prevent pilferage taken by other ports.

(13) To examine the use of mechanical equipment and alterations thought to be essential in the existing installations.

(14) To examine the possibilities of the establishment of an industrial zone.

An important factor in port operation is to get the loading and discharge of a ship, as far as possible, synchronised with the remaining steps ashore, especially as the greater proportion of port charges are made up of the expenses relating to those operations.

It is consequently essential that this point should receive particular attention, in view of the fact that lost time, resulting from slow handling is automatically reflected in a rise in the price of goods. Nearly 25 per cent. of the total of man hours are spent in breaking down sling loads and moving cargo in the ship's hold.

The Human Element

By a curious paradox it is the technical progress that steadily increases the importance of the human element[4]. Therefore, in order to attain the minimum delay and expenditure in all the operations dealing with the ship's loading and unloading—it is necessary that a modern port should have manpower of first quality and rely on an organisation capable of keeping up the operating of all the activities necessary to a regular traffic service.

As there is a close connection between the mechanical factor and the human element, it is essential to examine carefully the possibility of organising and stabilising the manpower at ports on the same basis as has already been done in several countries of Europe—England, France, Belgium, Holland, Sweden and also in Australia. The Labour Organisation is studying the universal adoption of similar plans

Suitable training and organisation of manpower will bring about an increase of output at ports, all the more because it is possible that the handling of cargo—done in different ways in various ports of the world—should in a more or less near future, be rationalised. This is certainly the aim of the port training established in Rotterdam, since September, 1949, by the initiative of Dr. F. J. Rutten, Professor of Applied Psychology of the Nijmegen University, which deserves special reference. Although with quite different features, there are already courses set up in 13 English ports, also intended for port employees.

Considering the features of the training instituted in Rotterdam, it was in fact this port which led the way into setting up a vocational training school for dock labour and its foundation means a social service of the utmost importance.

[1] A Transport and Communication Committee—divided into sections, one of which handles maritime ports and the merchant marine—was set up in January, 1953.
[2] Journal de la Marine Marchande, 15th January, 1953.
[3] Ibid, 5th March, 1953.
[4] The Human Element—study presented by Dr. J. Ph. Backx at Rotterdam Congress.

Education in Cargo Operations

(continued from previous page)

pondent was acquainted. Nor had he ever encountered a ship's officer who has not known "how to use the preventer guy properly."

A remark of Commander Sauerbier's which has irritated and annoyed many shipping people ashore and afloat was to the effect that the entire shipping industry has suffered in the past and still suffers to-day "because of a lack of educated and well-trained officers." None of the shipping leaders with whom the writer of this criticism had spoken had ever suggested that there is little point in spending time and money educating and training officers because they "leave the sea after getting a really good background."

The truth is, and it is not necessary to look far to find it, that British ships' officers are better educated and trained than ever they have been before, and this undoubtedly holds good in most other European maritime countries. Further, there are more and better facilities for education and training than there ever have been before.

Dolphins at the Port of Amsterdam

Installation of Flexible and Rigid Types

By ir. T. J. RISSELADA
(Chief Engineer of Public Works Department, Chief of the Harbour Works Division)

(concluded from page 56)

DOLPHINS IN FRONT OF A GRANARY

I.—General Layout.

In front of a granary it was necessary to build some dolphins in order to facilitate the berthing of vessels unloading direct into the silo, whilst at the inner side elevators and inland craft could be accommodated (see Fig. 3). Because of the existing suction outfit fixed to the granary, the distance between quayside and ship was limited to a minimum. Very small allowances therefore could be made for the play between inland craft, elevator and dolphins and for the width of the dolphins. Thus the clearance for inland craft was limited to 36-ft. with a play of 20-in. and the width of the dolphin proper to 5-ft. Though the normal type of vessel expected here is of the Victory or C3 class, having a displacement of up to about 18,000 tons, there also is to be reckoned with the berthing of vessels of the Mariner class, having a displacement of about 22,500 tons.

In order to provide adequate berthing accommodation either for seagoing vessels or for small craft it proved necessary to provide three dolphins. In addition, a mooring buoy and some posts are provided. Originally, the dolphins were to be spaced at distances of 115-ft. at centres, but owing to some obstacle in the subsoil the spacing had to be modified to 102-ft. and 128-ft. respectively.

II.—Choice of Type.

Due to the closely specified clearances, flexible dolphins were unsuitable. In considering rigid dolphins, an economical and satisfactory design in timber (hardwood) was not feasible, and reinforced concrete caissons with protection at both sides was ruled out by the limited width available. A cellular type of dolphin was adopted using second hand Larssen V sheetpiling available from post-war reconstruction in the port. This solution proved economical.

III.—Design of the Dolphin.

Using the available sheet piling it sufficed to give the dolphins a cross-section of 5-ft. x 16-ft. A driving depth of 31-ft. was required, thus bringing the total length to 77-ft. (Fig. 3).

The fore and aft walls were connected over nearly the whole height by arranging intermediary sheet piling at third points, partly to transmit shear forces, partly to forestall deformation ensuing from the oblong form of the cross-section.

In order to prevent buckling under impact and to obtain sufficient friction in the interlocks of the sheet piles needed to resist the shear forces in bending, some kind of filling was considered desirable.

Though experience teaches that the friction in the interlocks especially in the event of bending, is considerable and even liable to increase in course of time, it was not considered justified to rely entirely upon this, since heavy and repeated impacts such as occur during a storm, might get the dolphin into a vibrating motion which can have a detrimental influence on the friction in the interlocks.

To eliminate all risks the interlocks above the water surface were

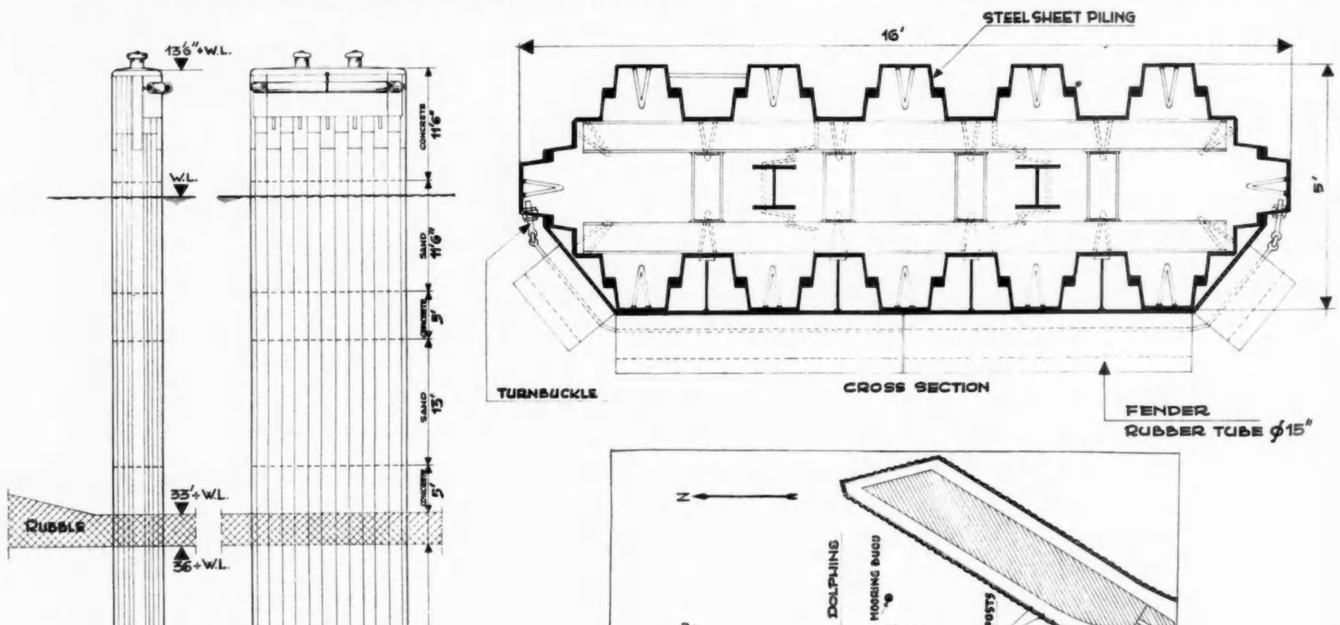


Fig. 3. Rigid Steel Dolphins in front of a Granary.

Dolphins at the Port of Amsterdam—continued

all welded and the piles provided with a kind of hairpins to ensure a solid bond with the concrete braces.

A total filling of concrete would have reduced resilience unduly; a filling of coarse sand was therefore chosen. However, to prevent buckling of the construction as a whole and to increase its torsion resistance two concrete braces were provided in addition to the concrete capping.

As the work absorption of this rigid type of dolphin is notably low it becomes of extra importance to keep the impact during the whole process acting as near the top of the dolphins as possible. This can be achieved by securing some kind of projecting rubbing fender. Since it is of great value to increase the work absorption of the construction at the same time, rubber fenders seemed most suited and therefore a string of 15-in. Goodyear Rubber Dock Fenders was fitted near the top of each dolphin.

IV.—Calculation.

The leading dimensions are shown in Fig. 3. The energy to be absorbed by a dolphin is assumed to be 0.45 times the total kinetic energy.

The basic design data are:—

Maximum displacement	22,500 tons.
Maximum berthing speed	8 ins. per sec.
Kinetic energy (impact at W.L. + 10′ 10″) ...	900 in. tons.
Static load (rope pull at W.L. + 14′ 1″) ...	75 tons.
Ditto (wind pressure at W.L. + 10′ 10″)	100 tons.

With a work absorption of 900 inch tons for the Victory or C3 class ships even a berthing velocity of 9-in./sec. is admissible. This is much higher than the maximum berthing speed of about 6-in./sec. as usually adopted in the port. However, taking into account the manoeuvring necessary prior to coming alongside, the high amount of work-absorption seemed well justified. The more so, as thanks to the previously mentioned rubber dock fenders the higher velocity causes relatively only a slight increase of cost.

Soil investigations indicated that the dolphins would penetrate into strata with low resistance as well as into strata of densely packed sand. Hence an average value for the angle of internal friction of 25° appeared to be reasonable.

Compared with the case where tubes were used in the flexible dolphins described previously, the relation between the dimensions of the cross section and the height of these rigid dolphins is of much greater importance. Therefore, it was considered useful to examine not only for the formulae mentioned in the first part of this article but also another developed by Fröhlich for foundations of masts.

However, in the case of foundations of considerable depth this formula proved to give too favourable a picture of the admissible loads and end-fixation obtained, and hence of the driving depth required. As in this case the static loads were the determining factor the formula developed by Blum was preferred for the present calculations.

Small scale tests showed the necessity of introducing among other factors the wall friction into the calculations not only to get a fully economical design but also to bring the width of the dolphin in accord with the given restrictions.

Again three cases in essence similar to those stated in the first part of this article were investigated.

A construction with a cross-section of 5-ft. x 16-ft. and a driving depth of 31-ft. proved to fufil the static requirements (1 and 2), but as the ultimate deflection amounted to 7-in. and the final impact to be withstood to 170 tons, the construction would fall short as regards the dynamic requirements (3) if there were not a resilient fendering (in this case of rubber) to supply the additional shock absorption required. As mentioned before, it seemed attractive from an economic as well as from a protective point of view to apply the rubber dock fenders. To find the best solution the costs per inch ton of energy absorbing capacity had to be calculated. From some graphs made available by the manufacturers[11] for various sizes of these rubber fenders (Fig. 4) curves were computed giving the load—energy relation.

For an ultimate load not exceeding the aforementioned 170 tons and a working fender length of no more than 10-ft., the quantity of work in inch tons absorbed by various arrangements consisting of one, two, three and four strings of tubular fenders with outward

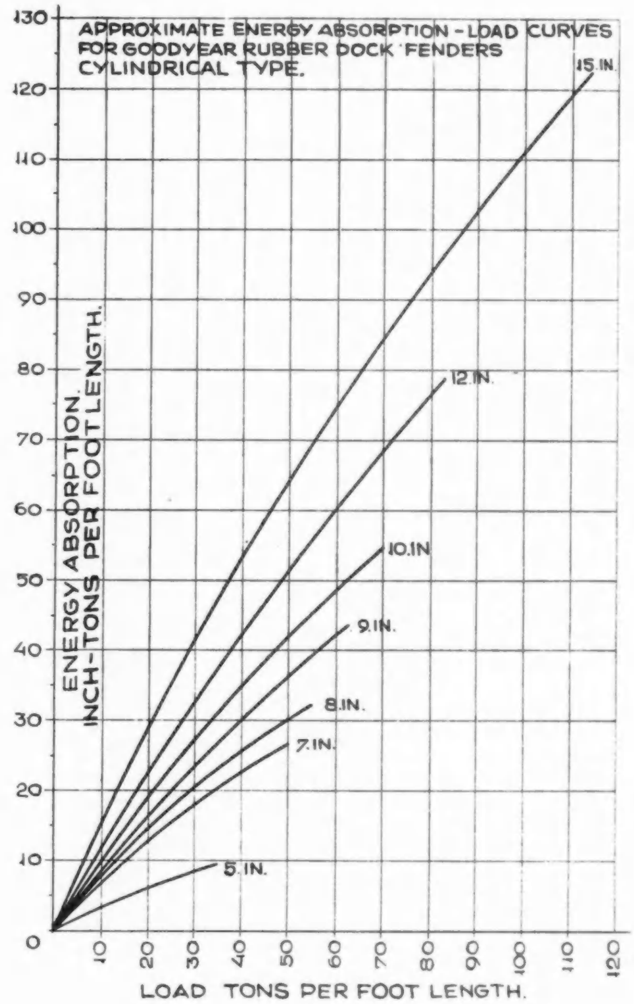


Fig. 4.

diameters ranging from 9-in. to 15-in. secured horizontally along the front of the dolphin one above the other, was calculated and the costs per unit of work absorption compared.

R. D. Fender.	One String.		Two Strings.		Three Strings.		Four Strings.	
	Work absorp.	Unit costs %	Work absorp.	Unit costs %	Work absorp.	Unit costs %	Work absorp.	Unit costs %
9″	138	100	179	156	194	203	210	265
10″	154	101	185	169	204	225	235	276
12″	197	123	247	197	296	246	321	303
15″	265	132	333	208	351	304	376	369

The figures of this table clearly show that notwithstanding the fact that the costs increase with increasing diameter it is far more economical to use a bigger size fender than to increase the number of strings.

A single string of 15-in. fenders proved to be an expedient solution as it can absorb the required amount of work at a very reasonable price.

V.—Execution.

It was essential that the dolphins be placed accurately, and three methods of erection were examined:—

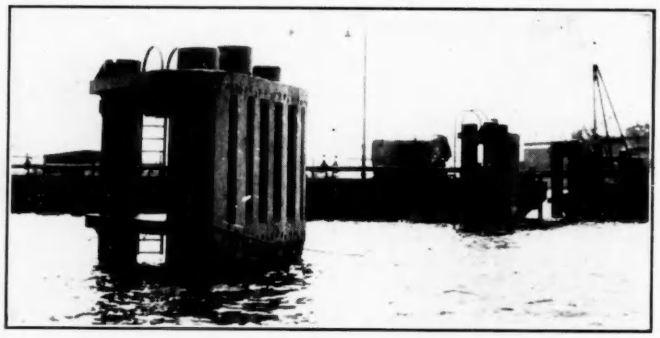
(1) Erecting the dolphin by having the sheet piles consecutively driven in one by one with the aid of a floating pile driver.

(2) Putting the sheet piles together in advance, conveying the whole to the place of destination (by water) and sinking them to their depth either by driving them singly or in groups consecutively stage by stage (system applied at Zeebrugge[12]) or with the aid of a self-emptying borer.

Dolphins at the Port of Amsterdam—continued

(3) As 2, but sinking the entire unit by means of vibrating the subsoil (system applied at Hamburg near the Elbe-tunnel[13]).

The first method follows tradition most closely, but requires extreme precision and a perfect technique of driving piles. By driving in the sheet piles consecutively, stage by stage the risk is reduced; but for sheet piles of some length a floating sheerlegs is needed to lower them in their correct place.



Front view of flexible dolphins, part of pontoon at rear.

(See previous issue for view of rigid type dolphin).

The second method offers the advantage that there is less difficulty in the correct assembly and siting. However, there is the difficulty that in this case more working space is needed for driving consecutive sections, whilst in the event of sinking with the aid of a self-emptying borer the subsoil is disturbed and consequently the support given by the surrounding soil to the piles is reduced.

The third method not only completely meets the latter difficulties, but—as opposed to sinking with the aid of a self-emptying borer—will even have a favourable influence on the subsoil and consequently on the driving depth and fixation of the dolphin. This method was not used however because the apparatus necessary was not available. With regard to the second method, pre-assembling the available second-hand sheet piles into larger groups proved an insurmountable difficulty.

Because of the propitious circumstances such as quiet water and no tides, it was decided to erect the dolphins according to the first method—i.e. entirely *in situ*—with the aid of an extremely skilled team of pile-driving artisans. Sinking the sheet piles by jetting was prohibited.

The driving took place with a normal floating rig of the Dutch type using a double acting steam hammer with a weight of 4 tons and a drop of 3-ft.

In order to facilitate pile-driving a frame was made, strutted against the quay of the granary. After the walls of the dolphin had been brought into place, the sheet pile partitions were driven in, which entailed no particular difficulties, because bringing the outer walls into their correct places had been successful.

The available sheet piles having a length of 70-ft., whereas the entire height of the dolphin amounts to 78-ft., the sheet piles had to be welded onto after their having been driven in. Neither this nor the welding of the interlocks above the water surface met with any considerable difficulties.

Before the filling in with sand and the concrete braces had been applied, a rigid bracing frame was mounted inside the dolphin in order to give the somewhat flexible structure its rigid form. Finally, the concrete capping was cast. The wire rope was first threaded through the rubber fender unit which was hoisted into place and the wire rope could be tightened by means of turnbuckles. As the last activity before the dolphin was delivered for use, rubble was dumped into a trench dredged round the dolphins in order to prevent scour by rotating ships' propellers.

REFERENCES.

1 For a more scientific treatment of this subject a publication by the T.N.O. (Applied Physical Research), The Hague, may be referred to.
2 The figures in Table 7a, in correspondence to the Editor of "D. & H.A.", Oct. '53, clearly illustrate the difference between the two solutions for dolphins of moderate size.
3 A report on this subject has recently been published by M. Müller on behalf of the International Navigation Congress in Rome, 1953; Question 2, Section I.
4 Prof. Siebel: Festigkeitsrechnung bei ungleichformiger Beanspruchung. Die Technik Dez. 1946.
5 Publication of the researches after this subject by Dr. Müller in Germany may soon be expected.
6 Two dolphins of this type have recently been fabricated by the Mannesmann Concern at Hamburg on behalf of the Ibano Oil Company.
7 B. F. Saurin in the discussion on some designs for flexible fenders published in "Proceedings of the Institution of Civil Engineers", Part II, Feb. 1953.
8 For further reading see Proceedings of the Second International Conference on Soilmechanics and Foundation Engineering, 1948, Vol. I.
9 Dr. Ing. Blum. Wirtschaftliche Dalbenformen und deren Berechnung. Die Bautechnik 1932 Heft 5.
10 "Der Grundbau". Teil II.
11 These graphs were published for the first time with the consent of the Goodyear Tyre and Rubber Co. by Prof. A. L. Baker in his paper contributed to the International Navigation Congress at Rome, 1953, Section II.
12 L. Descans: Ducs d'Albe en palplanches metalliques L'Ossature Metallique: Nov. 1951.
13 Gründungen durch Hochdruckverdichtung nach dem Rütteldruckverfahrens. Hansa 15.9.51.

Correspondence

To the Editor of *The Dock and Harbour Authority.*

Sir,

Thames Flooding

With reference to your Editorial Comment of June last concerning the above. The recommendation in the final report of the Waverley Committee on Coastal Flooding, that a flood barrier across the Thames to protect the London area should be investigated, is of considerable interest. I fear, however, that navigational objections to the scheme would probably be insurmountable.

In this connection, I recall the self-priming syphon spillway proposal discussed in "The Dock and Harbour Authority" editorial of January, 1951, and it is relevant to suggest that a syphonage scheme be also investigated.

The conclusions reached from the model tests, mentioned in the Report, indicating that the spill over the banks in the lower estuary during the floods of 1st February, 1953, had a negligible effect in lowering the water levels in London, might not be true of a syphon spillway. The feasibility of such a scheme to reduce water levels upstream would depend upon the time interval elapsing during the passage of the tidal high water crest from, say, Southend to the site of the syphons, together with the capacity of the marshes to hold the decanted water.

The nearer the syphons are placed to London the better, probably the only site now available would be Wennington Marshes, used as rifle ranges and grazing, and which have an adequate frontage. Refuge mounds would be provided for cattle on the marsh, and the syphon vents could be closed electrically on warnings from Southend or elsewhere.

The financial considerations involved in the syphonage scheme would be considerable but the cost of maintenance would be comparatively small and there would be no risk of damage to or from navigation.

20, Copse Hill,
Wimbledon, S.W.20.
July 9th, 1954.

Yours faithfully,
F. W. D. DAVIS,
M.Sc., M.I.C.E.

Improvements at Port of Garston.

The Docks and Inland Waterways Board of Management announce that the cranage and quay lay-out at Stalbridge Dock, Garston, are to be modernised at an estimated cost of £425,000. The scheme will be carried out at the east and south east berths of this dock and will provide for re-alignment of rail tracks on the quays, with additional lines and concreting of quay surface for the effective use of mechanical appliances; improved rail connections between the quays and the marshalling sidings; 12 electric level luffing quayside cranes of 65-ft. radius, four with a lifting capacity of 7½ tons adaptable for grab working, and eight of 3/6 tons; widening of the existing 13-ft. 4½-in. crane track to 15-ft.; and improved lighting of quays for night work.

Tide Gauges for the Port of Basrah

Automatic Visual and New Radio Indicators

By N. L. SPOTTISWOODE

The most serious obstacle to the entry and exit of shipping to the Ports of Basrah, Abadan, and the jetties at Fao in Iraq (where the Zubeir oil is loaded), is that the depth of water over the sand banks at the entrance to the Shatt-al-Arab river is only sufficient to permit passage over them during certain states of the tide, the height of which varies considerably under the influence of such unpredictable factors as wind and weather.

Before fully laden vessels are permitted to pass the traffic control point in the Shatt-al-Arab, or approach the Bar from seaward, it is vitally necessary that the exact depth of water on the Bar be known, and consequently this information must be available to the Control Officer at any moment throughout the twenty-four hours quite irrespective of weather, including sand and dust storms.

Obstructions of a similar nature exist at Karun Bar in the Shatt-al-Arab itself, and here also an exact knowledge of the state of tide is equally important.

At anchorages where vessels wait for the tide before proceeding, the Control Officer can be of little assistance, and here it is necessary to provide an indicator of visual form capable of giving the desired information direct to the master or pilot.

With increased traffic after the war and the development of the Iraq oil fields, the Port Directorate decided that improvements were necessary in the method for obtaining and transmitting actual R.O.T. to the Control Officer and to vessels direct.

The existing tide gauges, consisting of figured boards, or plates, successively obscured by the tide and illuminated at night by oil lamps under the care of local attendants were not to be relied upon and had only negligible range. Other types established where a supply of electricity was available, displayed coloured light code. Semaphore arm manually operated signals were also employed, but were unreliable owing to the factor of human error, and costly to man on continuous watch.

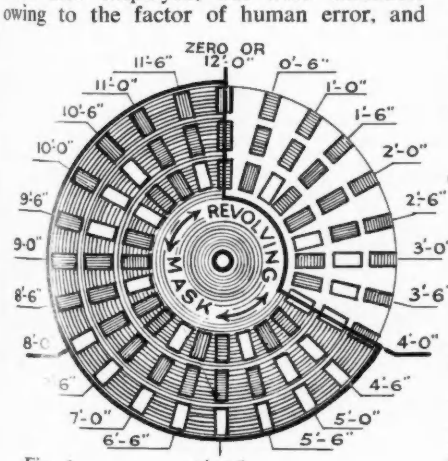
It was therefore decided to take steps to render the visual tide gauges effective at night and also to replace the Control Vessel by a dolphin structure carrying automatic apparatus for transmitting the rise of the tide by radio to the Control Office at Fao. The general specifications were worked out by Mr. H. C. Charman, at the time Lighthouse Engineer to the Port Directorate, and the development and production contract was placed with the Gas Accumulator Co. (United Kingdom), Ltd., of Brentford, England.

Considering first the visual tide gauges; any idea of efficiently illuminating the existing numbered boards was out of the question, owing to the absence of electric power. It was decided, therefore, to use a system of flashing acetylene lights in conjunction with a pre-arranged colour code.

The equipment, two sets of which were delivered to the Directorate in 1952 may be briefly described as follows:—

An accumulator housing is fixed to the top of the existing pile structure. Mounted on top of the housing are three range type lanterns with 12-in. lenses. Each lantern is fitted with a 15-litre burner and the three burners are connected to the outlets of a 3-way sequential flasher. Thus each lantern in succession gives a flash of 1 second duration, with 1 second eclipse between each lantern. After a further eclipse of 10 seconds, the cycle is repeated. As the lanterns are mounted close together, the appearance at any distance away is of a single light source giving triple flashes.

Each lantern is equipped with an automatic 3-colour spectacle changer between the burner and the lens, whereby the colour of the light may be either red, green or white. There are thus 27 possible colour sequences for the group of three flashes. Three of these, however, consist of a triple flash of the same colour and are thus not used to avoid possible confusion with existing navigational lights. There are thus left



BASRAH PORT DIRECTORATE

Automatic Night Tidal Signals indicating rise of tide

COLOUR CODE: Code to read off from periphery to centre

EXAMPLE = 2'-6"
Red Green White

The rise of tide is given every 6 inches from 0 to 12 feet by means of this colour code. Each separate signal is in the form of a group of three flashes.

When the first flash is Red, the R.O.T. is between 0 & 4 feet; when the first flash is White, the R.O.T is between 4 & 8 feet; and when the first flash is Green the R.O.T. is between 8 & 12 feet.

To assist decoding, turn the mask so that all signals are obscured except those of the group required.

For example: If the sequence of flashes is Red: Green: White, mask all except the group commencing Red, and then read off R.O.T. opposite colour sequence of signal observed.

Fig. 1.

Fig. 2.

24 possible colour combinations and since the total range of rise of tide which it is desired to signal is 12-ft., indications can be given every 6-in.

Fig. 1 shows the colour code which was adopted. All pilots are provided with a waterproof coloured card giving the code.

The spectacle changers are operated by gas pressures acting on diaphragms and two pipes run from each lantern to the coder to which is connected the tide drum for the float and counterweight.

The former is of 20-in. diameter, having a flotation of 12½ lb. per inch, and runs in a trunk tube down the centre of the structure.

The coder consists of 6 cams mounted on a common shaft, each cam operating a small valve via a spring loaded lever. The cam shaft is not coupled directly to the tide drum, since the latter moves very slowly, whilst it is necessary for the cam shaft to move round sharply in order to avoid the possibility of the valves remaining in an intermediate position for any appreciable time.

The connection between cam shaft and tide drum is, therefore, made by means of a step by step coupling. The tide drum, moving slowly, winds up a spring, but does not move the cam shaft. When the float has moved a pre-determined distance, a latch is disengaged, which permits the spring to pull the cam shaft round sharply through exactly 15°. No further movement of the cam occurs until the spring has again been wound up through a sufficient angle to release the latch a second time.

The operation of the equipment is thus entirely automatic and, to conserve gas, a standard AGA sunvalve is provided, which turns the burners off during the hours of daylight. The operating range of the signal is approximately 12 miles with an atmospheric transmission factor of .85 and the service period with 2 A-50 accumulators is six months. All moving parts of the coder run in an oil bath and the tide drum runs on a lead screw of the same pitch as the spiral carrying the phosphor bronze rope, so that the latter always pays off at the same position, thus avoiding the necessity of guide pulleys.

Fig. 2 shows one of the Visual Flashing Tide gauges *in situ*.

Turning to the Radio Linked Tide Gauge, this of necessity presented a more complex

Tide Gauges for the Port of Basrah—continued

problem and it was realised at the outset that the equipment could not attain the simplicity of the visual Flashing Tide Gauge.

The first point to be settled was the choice of a suitable parameter into which R.O.T. could be translated for transmission by radio. The most obvious choices were frequency or amplitude. For instance, the transmitter could be modulated at an audio frequency which could be varied according to a pre-determined scale by the R.O.T. and this frequency measured at the receiving station. Alternatively, the modulation frequency could be fixed and its amplitude varied by the R.O.T.

Neither of these solutions seemed at all promising owing to the impossibility of maintaining accuracy of calibration with variations of voltage, temperature, humidity, electrical interference and the ageing of valves and components.

Fortunately, the information-content of R.O.T. does not make any severe demands on a communication system. For although a fair degree of accuracy is required (in this instance it was decided to divide a total range of 14-ft. into 140 measurable units), yet the time which can permissibly be taken to transmit this information is very considerable by electronic standards. There would, for instance, be no point whatever in trying to compress the information into even such a long period as 10 seconds, since the maximum possible change of R.O.T. in this period is far less than the smallest change which it is necessary to indicate (1/10-ft.).

It was, therefore, decided to spread out the time taken to transmit each separate piece of information to approximately $2\frac{3}{4}$ minutes and it will be seen that even this is shorter than is strictly necessary.

This enabled a parameter to be adopted which is virtually unaffected by any of the variables referred to above, namely, that of pure number, i.e. the positive integers from 10 to 150. The range of R.O.T. is from -1-ft. to $+13$-ft., and if H is the R.O.T. in feet, the corresponding number to be transmitted is given by $N = (H + 2)\ 10$.

The transmitting of the numbers by radio

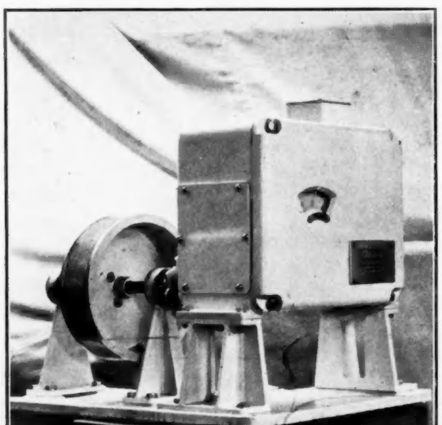


Fig. 3.

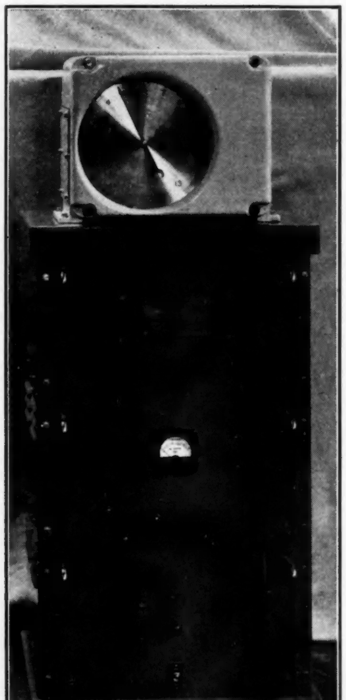


Fig. 4.

is effected by keying the transmitter, so that it sends out pulses of approximately 1/2 second duration with intervals of approximately 1/2 second. Thus if the R.O.T. is +4.3-ft. the transmitter will send out 63 pulses, taking approximately 1 minute 3 seconds and then will remain silent for about $1\frac{1}{2}$ minutes after which it will send another train of 63 pulses unless the R.O.T. has by then changed by at least 1/10-ft. The advantage of this system is that the amplitude, length, and frequency of the pulses can all vary within wide limits without affecting the R.O.T. recorded at the receiving end.

The Coder which translates R.O.T. into the appropriate number of pulses is shown in Fig. 3, and is an entirely mechanical device containing no calibrated variable capacitors or resistances. The operation will briefly be described as follows:—

The pulses are generated by a standard AGA electric flasher which is of the oscillating balance-wheel type; the contacts are closed for approximately half the swing and open for the other half. The exact proportion is not critical, nor is the period of oscillation, this being set to a nominal value of 60 swings per minute.

The contacts are connected across the keying terminals of the transmitter via a mercury switch in the coder. Hence, when this switch is closed the transmitter will be sending out pulses and when open the transmitter will be silent.

The requirements of this coder are thus, that it shall maintain the mercury switch closed for exactly the number of pulses required by the R.O.T.

The coder contains an electro-magnet which is energised from the transmitter H.T. via the flasher contacts. The armature of this magnet consists of an arm carrying a ratchet operating against a series of 160 teeth on the periphery of the coder pulsing wheel, so that the latter is moved forward one tooth at each swing of the flasher.

On the front face of the pulsing wheel is a cam which engages a spring loaded plunger fixed to the body of the coder, so that as the wheel rotates, this plunger is gradually forced back against its spring. When the end of the cam is reached, the spring snaps the plunger forward turning the mercury switch on by means of a forked arm carried on the pulsing wheel and a rod which passes out through its centre.

At each swing of the flasher the transmitter will now send out a pulse, and the pulsing wheel will move on one tooth.

On the back of the pulsing wheel is a similar cam operating a similar spring loaded plunger, but this latter plunger is carried in the tide wheel which is rotated by a reduction gear from the tide drum. The position of this second plunger is therefore determined by the R.O.T. so that the mercury switch will be turned off when the pulsing wheel has rotated by the number of teeth corresponding to the R.O.T. Since each movement of the pulsing wheel corresponds to one pulse from the transmitter, the latter will have sent out the correct number of pulses according to the equation given in the earlier paragraph. All moving parts of the coder work in an oil bath.

The output from the receiver is fed into an Integrator shown mounted on top of the receiver rack in Fig. 4.

The Integrator contains a counting wheel and a pointer wheel, each having the same number of ratchet teeth, and each spring loaded anti-clockwise by means of a spiral spring.

At the beginning of each train of pulses, the counting wheel is always fully anti-clockwise against a stop, whilst the pointer wheel (carrying the pointer) is in a position corresponding with the R.O.T. at the end of the last train of pulses. The pulses from the receiver are fed to an electro-magnet which moves the counting wheel one tooth clockwise for every pulse. If the R.O.T. has increased since the last signal, the pulsing wheel will eventually catch up with the pointer wheel, and will then move it one tooth at a time by means of two co-acting projections on the inner faces of the two wheels. If, however, the R.O.T. has decreased, there will be a gap between these two projections when the pulses cease and the counting wheel stops rotating.

Approximately 5 seconds after the pulses have ceased, a delay circuit in the receiver comes into play and performs the following operations in order:—

(1) Actuates an electro-magnet for about 1/2 second to release the retaining ratchet of the pointer wheel. If the R.O.T. has fallen since the last signal

Tide Gauges for the Port of Basrah—continued

the pointer will then fall back to its new position.

(2) After operation (1) is completed, releases for about 2 seconds the retaining and actuating ratchets of the counting wheel which then returns to zero in readiness for the next train of pulses.

It will be seen from this brief description that the pointer on the Integrator is always left at the position corresponding to the last signal, and this position is re-corrected either upwards or downwards at every rotation of the pulsing wheel at the transmitting end. In the event of one train of pulses giving a false reading due, for instance, to a temporary mains failure or to a severe burst of electrical interference, the correct reading will be restored within a maximum of $2\frac{3}{4}$ minutes as soon as normal conditions return.

Turning to the radio equipment itself, this was designed and constructed by Messrs. Webbs Radio in close consultation with the Gas Accumulator Co. (United Kingdom), Ltd.

The range required was approximately 15 miles, and since static is rather prevalent in the Persian Gulf area, it was decided to use a frequency in the V.H.F. band, and the Port Directorate were eventually allocated a frequency of 152 Mc/s exclusively for the Radio Tide Gauge.

Since the transmitter had to be operated by batteries, it was desirable to keep the number of valves to a minimum consistent with stability and an adequate output power. The output valve chosen was a type 832 in push-pull giving an output of 27 watts.

This was considered to be on the generous side and tests in London with the receiving aerial in a very unfavourable position have shown that the receiver worked satisfactorily with the gain control nearly in the minimum position.

The first valve is a crystal controlled oscillator-doubler with a crystal frequency of 8,444.44 Mc/s and keying is effected in the screen circuit which is fed from a gas filled voltage stabiliser; the oscillator is followed by a first tripler and second tripler, the latter being an 832 in push-pull.

The aerial is of the folded dipole type with matching bars and has one director and one reflector and is connected to the transmitter by a 300 Ohm. feeder. Transmitters and aerials are duplicated with a changeover switch.

Low tension at 12.6 volts is obtained from 13 Nife Cells in series with a barretter to regulate the voltage during the charge and discharge cycles. The high tension is provided by 210 Nife Cells and the Grid Bias by 42 similar cells. The transmitter works satisfactorily over an H.T. range for 250 to 300 volts and a corresponding Grid Bias range.

The normal service period is 14 days and suitable battery chargers and a diesel alternator are provided and form a permanent part of the installation at the transmitting station.

The receivers (one of which is shown in Fig. 4) being situated at the shore station derive their power from the mains. The bottom rack contains a conventional power pack supplying L.T. and H.T., the middle rack is the receiver whilst the top rack contains the various delayed circuits referred to above.

The receiver consists of an R.F. stage, mixer, crystal controlled oscillator, 3 I.F. stages (1.6 Mc/s), detector and output stage which feeds the operating coils in the Integrator.

The receiving aerial is identical with that at the transmitter and the entire receiving equipment, including aerial and Integrator is supplied in duplicate. The power packs are fed from the mains via voltage stabilising transformers.

It will be seen from this brief description that the Basrah Port Directorate have equipped themselves with tide gauges of the most up-to-date design. Indeed as far as is known both the flashing and Radio Tide Gauges are the first of their kind to be put into service anywhere. Future developments which are under consideration are a miniature receiver which would enable readings from the Radio Tide Gauge to be taken by pilots on board ship, whilst for other purposes a much simplified version could be developed for use where land lines are available between the transmitting and receiving stations.

Palletisation and Shipping — 1954

(2) Pallet Standardisation

By E. S. TOOTH

It is agreed in most quarters that pallet standardisation is vital to the development of the throughout movement method. It is therefore of interest that, concurrently with the work being undertaken on this subject at international level, many nations are in course of formulating standards of their own. A technical committee of the British Standards Institution, for example, has almost finished work on a "British standard for pallets for materials handling, suitable for road and rail transport." This document consists of clauses covering (1) foreword, (2) scope, (3) dimensions (including those of minimum openings in bottom decks of pallets—in connection with handling by pallet trucks), (4) definitions, (5) designations, (6) rating (working loads), (7) testing, and (8) marking. Although comprehensive, it is concerned mainly with dimensions, and there is a proposal to follow it up with a further standard on materials for pallet construction.

The preparation of this British standard has been the responsibility of technical committee MEE/113, which also appointed the United Kingdom delegation to the committee set up by the International Organisation for Standardisation to consider international standards for "pallets for unit load method of materials handling." Hence in the United Kingdom there has been close co-ordination between the national and the international work on this subject.

The first meeting of the international committee (ISO/TC51) was held in London on three consecutive days in December, 1952. There were nine participating nations and four international organisations sent representatives who took part in discussions without the right to vote. The meeting passed the following six resolutions:—

(1) The committee is agreed that in designating a pallet by its length and width, the shorter of the two dimensions shall be placed first.

(2) and (3) The committee is agreed that the I.S.O. should recommend the adoption of pallets of nominal plan sizes (a) 40-in. x 48-in. and (b) 32-in. x 48-in. as international standards.

(4) The committee agree to defer consideration of pallet sizes 32-in. x 40-in., 40-in. x 40-in. and 46-in. x 46-in., and also for a pallet of nominal plan size of 20-in. x 28-in. for the carriage of tinplate and steel sheets, until the next meeting. In the meantime, member bodies are requested to examine the usage of these sizes in their countries and to send to the secretariat the fullest information for the use of the committee.

(5) The committee is agreed as to the necessity of establishing an international standard for a pallet specially for sea transport without deciding, at this stage, its dimensions.

(6) The committee agree by a majority, that the I.S.O. should recommend that the pallets forming the subjects of resolutions (2) and (3) shall be so constructed as to permit the entry of lifting trucks preferably from any side but at least from two sides.

Resolutions (2) and (3) are the subject of a draft I.S.O. recommendation.

Before the 1952 meeting terminated, the committee also decided to set up a working group to give further study to the items still outstanding on the agenda, and this group provided valuable information for consideration at the second meeting of the full committee which was held, again in London, on the 21st to 23rd June, 1954.

This meeting was attended by delegations from Australia, Belgium, France, Germany, Netherlands, Norway, Sweden,

Palletisation and Shipping—1954—continued.

Switzerland and the United Kingdom. The U.S.A. and the following organisations also sent representatives as observers able to take part in the discussions but not entitled to vote: Economic Commission for Europe, International Cargo Handling Co-ordination Association, International Container Bureau and the International Union of Railways. The secretariat was again, of course, provided by the British Standards Institution.

In addition to the above mentioned nine participating countries, there were fifteen observer nations who, although not attending, specifically asked the I.S.O. to keep them informed of what transpired at the conference. They were Chili, Czechoslovakia, Hungary, India, Italy, Japan, Mexico, New Zealand, Portugal, Rumania, Spain, South Africa, U.S.S.R. and Yugoslavia.

One of the decisions made at the meeting was to propose the adoption, as a standard, of a two- and four-way pallet of effective plan dimensions of 32-in. x 40-in. (800 mm. and 1,000 mm.) for international transport. Pallets of plan sizes 32-in. x 48-in. and 40-in. x 48-in. were already the subject of a draft I.S.O. recommendation and since the conference produced proposals upon tolerances, rating and certain other important details of these two particular pallets, work on them is now nearing completion. The question of rating being of vital importance to those engaged in port operating work, the full wording of the proposal is given: "Non-expandable pallets of 32-in. x 48-in. and 40-in. x 48-in. sizes shall be capable throughout their working life of supporting a uniformly distributed load of 1,000 kg. whilst being handled, and of supporting a uniformly distributed load of 4,000 kg. when stacked."

Another resolution dealt with the width of wing of the wing-pallet, which, it was proposed, should be a minimum of 3½-in.

When discussion turned to the stevedores' pallet, it was soon obvious that the question was still a controversial one. Some nations favoured a plan size of 48-in. x 64-in.; others a size of 48-in. x 72-in.; whilst still others found it difficult to make any recommendation at all.

The attitude of the United Kingdom delegation to standardising a stevedores' pallet can be summed up thus. This pallet has three main uses: (1) it can be employed purely as a dock tool, in which case it does not come within the scope of the work of the committee; (2) it can be used between port and port, in which case there are reasons for formulating a standard for it. When thus employed, it normally remains the property of the shipping company and usually travels backwards and forwards over the same transocean route. In these circumstances, it is a shipping company's tool and therefore, many maintain, need not be standardised. If these instances of use are multiplied sufficiently, however, the time comes when several lines of palletised traffic converge on the same port and in such circumstances, unless the pallets are of standard dimensions, the stevedoring authorities will have to hold a wide range of handling machines and maybe change their equipment for each different consignment. There is, therefore, a case for establishing a standard for a stevedores' pallet used between port and port—a "marine pallet," as it is now frequently called.

Finally, the third use for this pallet is as the basis of a unit load travelling from manufacturer to purchaser abroad—that is, in the throughout movement method. A pallet measuring something like 6 feet long and 4 feet broad, however, would present handling difficulties to existing British road and rail transport, and the United Kingdom delegation was therefore doubtful about recommending the standardising of it for this purpose.

The importance in pallet standardisation of the dimensions of road and rail vehicles cannot be over stressed. It can be appreciated, for instance, by a study of the position in the U.S.A., where there are over a hundred different pallet sizes in use. In that country, because of the wide variations in climatic conditions —summer temperatures are extremely high, while those of winter may be 20° F. or more below zero—rail trucks are usually of covered or boxed construction, and road vehicles covered and end-loading. When pallet sizes were considered by the American National Bureau of Standards, three sizes were favoured, viz., 32-in. x 40-in., 40-in. x 48-in. and 48-in. x 48-in. The reason for this was simply that the width of the standard U.S.A. rail wagon is 96-in. and that of the road vehicle 80-in.

However, to those close to maritime matters, the question of standardising a stevedores' pallet was one of the most interesting which arose during the I.S.O. meeting. One of the first points made was that among its duties is to carry two "normal" size pallets—e.g., to lift them into or out of ship's hold. To accommodate satisfactorily two four-way pallets 40-in. x 48-in., the stevedores' pallet should be perhaps 75-in. long. On the other hand, the 1.8 metres wide (71-in.) doorways suggested for the new continental railway wagons (the doorways of existing wagons are only 63-in. wide), only permit the loading into the wagon of pallets of about 70-in. maximum.

Other points made also revealed the need for further research into the present and future use of the stevedores' pallet before a useful resolution upon even plan-size can be drafted. It was suggested in the discussion that examination of the subject had been complicated by the general use of the term "stevedores' pallet". This article, it was emphasised, is nothing more than a pallet large enough to carry an economic load in port work, whilst still being satisfactory for the throughout movement method. To call it a "stevedores' pallet" is misnaming it and misleading.

The conference finally decided that, since a satisfactory decision could not be reached without further investigation, the matter should be referred to a specially constituted working party, which will probably meet later in the year in Holland.

Since the I.S.O.'s final decision on this matter will have an influence on the width of doorways of wagons to handle these large pallets, it was also recommended that the International Union of Railways should be informed that this question of the marine pallet is being studied.

Before concluding its final session, the conference gave consideration to the work yet to be done and matters still to be studied. These included (a) details (rating, etc.) of the newly-proposed pallet of plan-size 32-in. x 40-in., (b) pallet testing, (c) terminology and definitions, (d) securing of loads, (e) dimensions of loads, (f) chamfered edges of pallets, (g) minimum bearing area of bottom deck, (h) expendable pallets, (i) the need for standardising certain pallet-handling equipment and, of course, (j) the stevedores' or marine pallet.

The second I.S.O. meeting having concluded, there will again be a tendency to look for immediate tangible results. It should be emphasised, therefore, that the technical committee has the power only to recommend. A draft recommendation, together with an explanation, is submitted to the I.S.O., and since all member bodies of the I.S.O. have to be circulated more than once before a recommendation can become even a draft standard, considerable time must always elapse before the work of a meeting begins to materialise.

However, particularly to maritime nations, the vital importance of the work of ISO/TC51 is the influence it will have on the future of palletisation in sea transport. On this matter, the first thing to be said is that standardisation, when it becomes effective, must surely tend to eliminate some of the difficulties which have delayed the development of the throughout movement method even in short sea traffic. The fact, too, that committees are working on standardisation in the public eye will cause many organisations and enterprises to give renewed consideration to the potential benefits of transporting goods across land and sea as economic unit loads instead of as individual packages requiring manual handling at every point of transfer of custody. It is possible, therefore, that as a result of this work more links will be forged in the throughout movement chain. If this occurs, a substantial proportion of the interests involved may ultimately decide that palletisation can be profitable and, once that stage is reached, the desired large-scale developments may at last begin.

One thing, however, seems certain. The satisfactory introduction of the throughout movement methods into transocean trading cannot be accomplished without the co-operation of ship owners, for it appears highly probable that the receiving aboard and stowing of large quantities of palletised unit loads speedily, safely and without loss of space, cannot be performed satisfactorily unless ships are designed with this purpose in view.

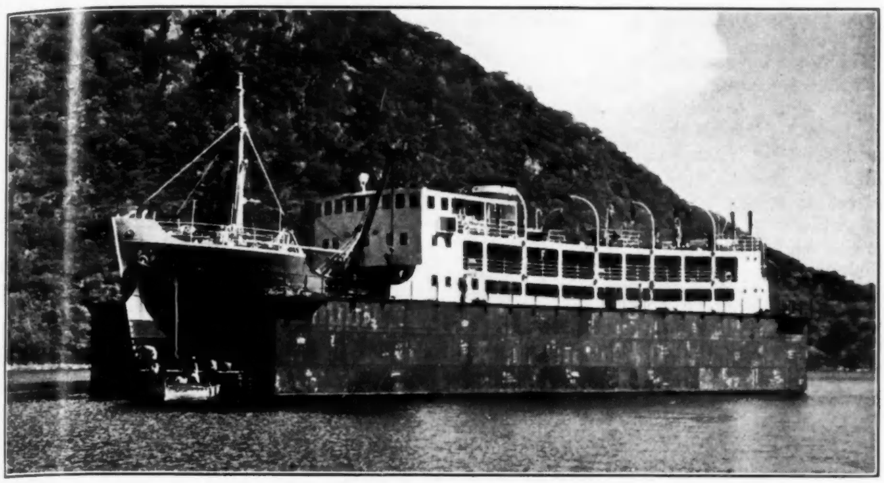


Fig. 1. M.V. *Ilala* in Floating Dock.

Floating Dock in Central Africa

Erection of a 500-Ton Dock on Lake Nyasa

An unusual erecting job was completed recently on Lake Nyasa, Central Africa. A floating dock with a lifting capacity of 500 tons, designed for use on this fresh-water lake, was constructed in England, shipped out in parts to Africa, and finally assembled and riveted on the shore of the lake and on the lake itself, employing African labour. The dock has been provided for the maintenance of the Nyasaland Railways' lake fleet, the largest of which, the m.v. Ilala (420 tons light displacement), had previously been erected by the same staff. The fleet also includes the 'Mpasa, of 250 tons, seven tugs and some minor vessels. The railways' new maintenance base is in sheltered Monkey Bay, and a floating dock was necessary as the lake is subject to a 20-year cyclic rise and fall of 18-ft. Figs. 1 and 2 show the Ilala docked for the first time.

The floating dock consists of 4 pontoons, each 5-ft. 10-in. deep, 51-ft. 3-in. wide and 33-ft. 4-in. long, arranged in line with a gap of 4-ft. 2-in. between adjacent pairs. The overall length of the pontoons is thus 145-ft. 10-in. The two side walls of the dock, bolted along the top edges of the pontoons, are vertical plated caissons 15-ft. 10-in. high and 5-ft. 5-in. wide, with three watertight bulkheads in each. With a platform cantilevered out 7-ft. 6-in. at each end of the pontoons, the overall length of the dock is 160-ft. 10-in., and with fenders on the inner faces of the side walls there is a clear entrance width of 36-ft. The machinery of the dock comprises a 10-kW. diesel generator set, a 7-brake horse-power motor, control gear, 7-in. centrifugal pump, pipes, valves, valve-lifting gear, etc. The engine house in on the starboard wall. The gross weight of the dock is 411 tons; with 175 tons of water remaining in the pontoons, the gross weight is 586 tons.

The first consignment of material arrived in Nyasaland at the end of 1950. As, however, all the railway staff skilled in this kind of work were fully engaged on the erection of m.v. Ilala, and on other duties, it was not possible to start work on the dock until April 1951. Most of the erecting work was carried out on the shore of the lake. The pontoons presented no special difficulties. As much as possible of the internal riveting was done before the top plates were put on; the temperatures at Monkey Bay (as high as 97 deg. F. in the shade) made conditions very trying for those who had to work inside, especially after the top plate had been fitted. The piping was installed in the pontoons before the top plating, but the joints were not finally made in case the pontoons should deform slightly after launching. Before

Fig. 2. Bows of vessel and dock.

painting, the pontoons were tested by means of a water hose on the outside surfaces and the internal bulkheads. The first pontoon was launched in November, 1951, the second in January, 1952, the third in May, 1952, and the fourth in July, 1952.

Meanwhile, in March, 1952, a start had been made on the erection of the side walls. It was decided to erect them only partly on shore, and then to skid them sideways on to the floating pontoons. The floor plating, all the vertical frames and the bottom strake of side plating were erected and riveted before moving the side walls into place. As they would have been difficult to move longitudinally, great care was taken to ensure that they were erected in their correct relative positions. The four pontoons were then moved off-shore opposite the side walls and ballasted with water to bring their decks to the correct level to receive the walls. Two skid rails were laid on the deck of each pontoon, continuing out under the walls, and the walls were then moved by means of jacks. The relative longitudinal positions of the walls were carefully maintained during jacking. When the walls were approximately in their correct positions, at the right distance apart, each pontoon in turn was flooded

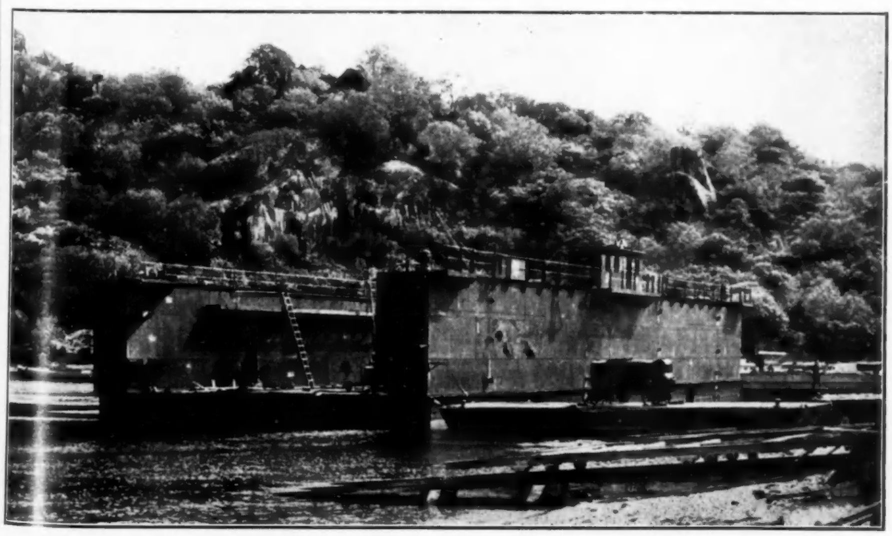


Fig. 3. View of Dock under construction.

Floating Dock in Central Africa—continued

sufficiently to withdraw the skids, and then pumped out until it came into contact with the bottom of the walls, when it was finally adjusted to its correct position and service bolted. This operation was carried out in July, 1952.

The remaining erection and riveting of the side walls were then completed. Holes for the bolts connecting the walls to the pontoons were reamed out and watertight joints made with three layers of canvas steeped in red lead. The machinery and piping were then installed and all pipe joints made. The pontoons were given two coats of bituminous solution and one of bituminous enamel on the outside, and one coat of non-drying grease paint on the inside. The side walls were painted externally with two coats of red lead and one of oil paint.

Except for some minor painting, the dock was completed on March 23rd, 1953. It was tested by sinking it to its full depth and pumping out. A week later, the m.v. Ilala was docked for hull inspection. The dock was lowered in 90 minutes, and at the end of this time there were 7-ft. of water over the keel blocks at the bow end of the dock and 8-ft. at the stern. The ship was then warped into the dock, using two lines at the bow of the ship and a tug at the stern to keep her straight. Though there was a fair breeze blowing at the time, the operation presented little difficulty. The ship, drawing 4-ft. 10-in. forward and 6-ft. 9-in. at the stern, was brought into the dock in 40 minutes. At 9.47 a.m. pumping was commenced, and at 10.30 a.m. the keel blocks first came in contact with the vessel at the stern. When contact had been made over the whole length the bilge blocks were hauled into place and the side shores tightened. At 1.15 p.m. the pontoon decks were 9-in. above the water level and pumping was stopped. The dock and ship in this condition are shown in Figs. 1 and 2. Fifteen days later the dock was lowered. The valves were opened at 1.45 p.m., the vessel was afloat at 3.12 p.m. and it was clear of the dock at 3.38 p.m. Subsequently, the dock was raised in two hours.

The dock was built for Nyasaland Railways, Limited, by Head, Wrightson and Company, Limited, Thornaby-on-Tees. It was designed by the late Dr. E. H. Salmon, M.I.C.E., of Messrs. Clark and Standfield; and the consulting engineers to the Nyasaland Railways were Messrs. Livesey and Henderson, 12-18, Moorgate, London. We are indebted to the Consulting Engineers and "Engineering" for supplying the illustrations and some of the details contained in this article.

SITUATIONS VACANT

BRITISH TRANSPORT COMMISSION.

DOCKS AND INLAND WATERWAYS—HUMBER PORTS.

Applications are invited for two posts in the Department of the Civil Engineer, Humber Ports, Hull, for men with experience of design of structures, either land or marine, in reinforced concrete, timber or steel. Salary up to £900 per annum, according to qualifications and experience. Contributory Superannuation Scheme.

Applications giving details of age, experience and present position should reach the Chief Docks Manager, British Transport Commission (Humber Ports), Dock Office, Victoria Square, Hull, not later than 14 days after the publication of this advertisement.

TENDERS

GOVERNMENT OF HONGKONG—AIRPORT DEVELOPMENT.

The Government of Hongkong will call for tenders within the next six months for the development of the existing airport at Kai Tak. The work involves the construction of 3¼ miles of sea wall, the reclamation of approximately 160 acres of land, and the construction upon the reclaimed area of a paved runway 7,200 feet long by 200 feet wide with associated link tracks, drainage and other services. Out of approximately 11 million cubic yards of material required for the reclamation, approximately 2 million cubic yards will be obtained by the demolition of hills in the approach to the runway and the remainder will be obtained by dredging from the sea bed.

Any contractor interested in tendering for the above work should communicate with:—

Scott & Wilson, Kirkpatrick & Partners,
Kai Tak Airport, Hongkong.
Or at: 47, Victoria Street, London, S.W.1

from whom further particulars can be obtained.

LIMERICK HARBOUR COMMISSIONERS.
NEW GRAB HOPPER DREDGER.

The Limerick Harbour Commissioners invite tenders from experienced Dredger Builders for the construction of a new Self-Propelled Grab Hopper Dredger of the following approximate dimensions:—

Length O/A	134′ 6″
Length B.P.	128′ 0″
Breadth Moulded	32′ 0″
Depth Moulded	13′ 0″
Hopper Capacity ...	400 tons.

Drawings, Specifications and Conditions of Contract may be obtained from the Commissioners' Consulting Engineers, Messrs. Rendel, Palmer & Tritton, 125, Victoria Street, London, S.W.1.

Tenders, in sealed envelopes, endorsed on outside "TENDER FOR DREDGER" and addressed to "The Chairman, Limerick Harbour Commissioners, 96, O'Connell Street, Limerick," must reach me not later than the 20th September, 1954, and remain open for acceptance up to the 20th December, 1954.

The Commissioners do not bind themselves to accept the lowest or any tender and reserve the right to reject any tender without assigning any reasons.

(Sgd.) D. O'BRIEN,
General Manager and Secretary.

THE ASSOCIATED ETHYL COMPANY LIMITED.
SEA WATER PUMP AND SLUICE VALVE.

33″/36″ DRYSDALE HORIZONTAL PUMP with C.I. divided casing, used for pumping sea water. Phosphor bronze impeller, M.S. spindle and bronze sleeves. Bedplate for motor. Motor required but not available for sale: 590 B.H.P. (400 volts, 3 phase, 50 cycles).

	Delivery:		
Total head from all causes, in feet ...	50	45	40
Gallons per minute	30,000	23,000	15,000

36″ ALLEY & McLELLAN No. 270 C.I. "SENTINEL" SLUICE VALVE, hand or electrically (5 h.p.) operated, and used for control of flow of sea water.

The Sluice Valve is available for inspection at The Associated Ethyl Company Limited, Hayle, Cornwall. Telephone number: Hayle 2351.

The pump casing can be inspected at the same address, and the impeller unit may be seen at The British Hydromechanics Research Association, Eastern Industrial Estate, Harlow, Essex, after first making an appointment through us at Northwich (Telephone number: Northwich 3241, Extension through us at Northwich (Tel. number: Northwich 3241, Ext. 129).

GOVERNMENT SURPLUS AMERICAN MOBILE BULK GRAIN SUCTION PLANTS.

Located in Nottinghamshire, Norfolk and Kent, each comprising articulated petrol-driven towing Unit and trailer mounted with diesel-driven grain moving equipment. Subsidiary equipment and workshop repair equipment.

Applications for tender documents should be addressed not later than July 26th, 1954, to Controller of Supplies, Ministry of Works (Disposals), Great Westminster House, Horseferry Road, London, S.W.1.

FOR SALE

TWO UNUSED 355 b.h.p. 0-6-0 Diesel Electric Shunting Locomotives. 4′ 8½″ gauge, weight 55 tons, tractive effort 32,000 lbs. Price and details from: Box No. 161, "Dock & Harbour Authority," 19, Harcourt Street, London, W.1.

WANTED

The following back numbers of "The Dock & Harbour Authority" are urgently required by The Melbourne Harbour Trust:—July, August, September 1945; July 1946; January, June, August 1947; February 1948; December 1950. Any readers who have any of these copies available are requested to write to: Box 163, "Dock & Harbour Authority," 19, Harcourt Street, London, W.1.